The Engineering and Mining Journal

VOLUME 95 JANUARY 18, 1913 NUMBER 3

Metallurgy of the Homestake Ore—I

The Homestake ore lies in a mineralized zone of nearly vertical Algonkian slates and schists, having a general trend to the north-northwest and dipping slightly toward the east, into which some enormous masses of rhyolite have been intruded; some of the ores contain garnet, some pyrites and some graphitic material. The orebodies follow roughly the direction of schistosity and show a general pitch southward. Where several unite the aggregate thickness is over 500 ft., and many stopes are carried across that width of ore.

The ore varies greatly in its general character in different portions of the deposit, but that of the deeper levels usually contains either chlorite or ferruginous hornblende (cummingtonite) with quartz, pyrite, pyrrhotite and carbonates of calcium, magnesium and iron. Arsenopyrite, garnet and mica are met in varying proportions. In a general way it may be said that the ferrous minerals predominate, but in the upper portions of the deposit the iron of the sulphides, and to a varying extent of the other minerals, has been oxidized to limonite, etc.

THREE MILLS OF THE HOMESTAKE COMPANY AT LEAD, S. D.

Note—Abstract of a paper read by A. J. Clark and W. J. Sharwood, presented before the Institution of Mining and Metallurgy, Nov. 21, 1912.

Preliminary Breaking at Shafts

The accompanying sketch map shows the general topography of the district and the situation of the principal buildings and shafts, most of the openings being at an altitude a little over 5200 ft. above sea level. The bulk of the ore treated comes from five of the shafts, one of these being 1900 ft. deep. At the shaft heads are placed gyratory crushers of the Gates type, there being six at the Ellison shaft, four at the Golden Prospect (Highland), four at the B. & M. (Old Abe), three at the Old Brig (Terra) and two at the Golden Gate (De Smet). The ore is trammed from the shafts in cars holding four tons each, moved by 15-ton Porter compressed-air locomotives; the main tramway serving the Lead mills has 22-in. gage and 40-lb. rails; in other places 25-lb. rails are used.

There are storage bins at the various shafts and from these the ore is drawn to be carried to the mills. The mill bins have a capacity of about 24-hr. supply in each case.

Due to the fact that the Homestake represents an amalgamation of many properties, some having already had reduction works installed, the mills are spread over a great deal of territory and are in many units.

In the combined mills a total of 1000 stamps crush over 125,000 tons per month. Of this total 57% is treated as sand, and 41% as slime. Between 1 and 2% of the slime is wasted. A total recovery of about 94% is obtained, of which 72% represents the recovery by amalgamation and 22% by cyanidation. The ore carries about 0.2 oz. gold per ton, or about $4 in value.

Stamp Milling in Water

The ore is fed to the stamps by means of wood-frame Challenge feeders driven from the second stamp of each mortar. One camshaft is provided for each 10 stamps and the cams are secured with one key. An individual 25-hp. motor drives each 10 stamps, the motor being placed at about the level of the camshaft with about 20 to 25 ft. distance for the belt drive. The stamps weigh about 900 lb. with new castings and the average is about 850 lb. or slightly more. In the Lead mills the drop is 10 in., although some of the other mills have a slightly less fall. The Homestake order of drop, 1-3-5-2-4 or 1-4-2-5-3, has been tested in competition with other variations and has shown a slight advantage in tonnage milled.

The screens used are No. 8 diagonal needle slot, which nearly corresponds to 30- or 35-mesh wire screen with 900 to 1200 holes per sq.in. The material is No. 20 cold-rolled, re-annealed and pickled openhearth steel, about 0.035 in. thick, 9x50 in. with a 1-in. rim. The openings are slots 0.022 in. by about 0.5 in. They are inclined 45° and make up about 15% of the total area of the 7x48 in. within the solid rim. The burr produced in punching is turned toward the inside of the mortar. This screen has been found to excel all others, considering crushing capacity and amalgamating efficiency together.

Milling is in water and a rather large ratio is used, especially at the Lead mills, where it is about 10 or 12 of water to one of ore. A minimum of about 50,000 tons of water per day is used, most of which comes from Spearfish Creek and its tributaries, much of it being conveyed over 20 miles in ditches and vitrified clay pipe. The water is nearly free from sulphates and chlorides, but contains carbonates of lime and magnesia.

Careful Amalgamation a Leading Feature

In Table I is shown the stamp and plate equipment of the various mills. Inside amalgamation is practiced, a copper plate ¼ in. thick and five or seven inches wide being attached to the chuck block under the screen in each mortar. The wider plate with high chuck is used with new dies and is changed for the narrower one as the dies wear.

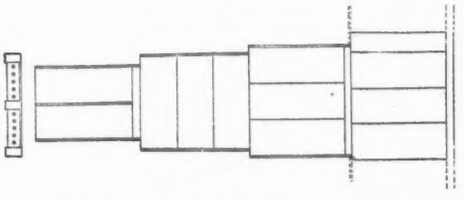
The outside plates are of ⅛-in. Lake Superior copper in units 4 ft. 6 in. wide and 12 ft. long. One such unit of plain copper is placed immediately in front of each five-stamp battery, and below it are two or three rows, usually wider, of plates which are silver plated with two ounces of fine silver to the square foot. In Table II is shown a diagram of the plate arrangement and the approximate distribution of recovery in the Amicus mill, the largest and last to be fully equipped. At some of the other mills conditions have prevented the installation of an equally complete plate system, and in others the grade and character of the ore treated have not warranted the addition of a fourth row. The aim has been to increase the width of successive plates in order to have a constantly thinner flow of pulp, which tends toward giving the finer gold an opportunity to come in contact with the plate.

TABLE I—HOMESTAKE STAMP MILLS
Square Feet of Plate Surface

Mill	Number of Stamps	1st Row, Plain Copper	2d Row, Silvered Copper	3rd Row, Silvered Copper	4th Row, Silvered Copper	Total Outside Plates	Outside Plates per Stamp	Where Situated	Drops per Minute	Initial Drop, in.	Altitude at Mortar Block, ft.
Amicus (Highland)	240	2,592	3,888	3,888	*4,536	14,904	62.1	Lead	86	10	5,146
Golden Star	200	2,160	2,700	2,700	3,848	11,408	57.0	Lead	87	10	5,143
Homestake (Eighty or Old Mill)	200	2,160	3,780	*4,104	...	10,044	50.2	Lead	87	10	5,161
Pocahontas (Deadwood-Terra)	160	1,728	1,140	*1,728	...	4,596	28.7	Terraville	90	8.5	5,130
Monroe (Caledonia)	100	1,080	864	*1,944	...	3,888	38.9	Terraville	90	8.5	5,068
Mineral Point (Father de Smet)	100	1,080	1,080	*1,080	...	3,240	32.4	Golden Gate	90	8.5	4,940
Totals and averages	1,000	10,800	13,452	15,444	8,384	48,080	48.08	.....	88	....	.....

* Separate Platehouse.

TABLE II. PLATE ARRANGEMENT AT AMICUS MILL
(Diagram of Plate for Ten Stamps Crushing 42 Tons per day.)



	Battery	1st Row Plain Copper	Trap	2d Row, Silver Plated	3d Row, Silver Plated	Trap	4th Row, Silver Plated	Trap	
No. units of plate..	..	2.0	..	3.0	3.0	..	3.5	..	11.5
Grade, in. per ft....	..	1.0	..	1.5	1.5	..	1.5	..	....
Width,ft.	..	9.0	..	12.0	13.5	..	15.75	..	....
Length, ft.....	..	12.0	..	13.5	12.0	..	12.0	..	49.5
Area,sq.ft.	2.0	108	..	162	162	..	189	..	621
Per cent. amalgam	34.3	46.4	..	10.6	5.6	..	3.1	..	100
Per cent. of value recovered....	46.5	43.0		5.7	3.1	..	1.7	..	100

Mercury is fed hourly into the batteries, this system having been justified by repeated tests in comparison with other methods. The loss of mercury varies from 0.06 to 0.17 oz. troy, an average being 0.132 oz., equal to about 0.5c. per ton milled.

A certain number of chuck blocks in each mill are changed every day and the amalgam cleaned from the inside plates. The entire round of the mill is made in 15 or 16 days. The outside plates are cleaned once every day, except those of the last row, which are cleaned on alternate days. The amalgam is removed from the first-row plates with a small whisk broom and from the lower plates with a long-handled floor broom of stiff straw. No sweating or scraping is practiced.

The best results are obtained by keeping the amalgam fairly soft and with temperature of mill water about 50° F. At higher temperatures the mercury runs off and the amalgam left becomes hard and difficult to remove. Table III shows the recovery of amalgam in the stamp mills.

Amalgam Is Retorted and Melted in Graphite Crucibles

All of the amalgam is brought to the assay office three times per month and the weight recorded from each individual mill is verified by weighing to 0.1 oz. The amalgam is put into cast-iron trays, which are placed in cylindrical retorts and the covers luted and keyed on. Each of the five retorts will hold 7000 oz. of amalgam. Wood fires are started at about 3 p.m. and an hour later the mercury begins to flow from the condensers. The fires are kept up as long as mercury continues to come over. About 8 a.m. the next day the retorts are opened, the sponge taken out, the product of each mill weighed to the nearest ounce and the whole divided so as to give bars of about equal size, not exceeding 2000 oz. troy.

The bullion is melted in No. 50 graphite crucibles in wind furnaces burning coke, with four pounds of pulverized borax to each pot. With four furnaces, four bars, or nearly $130,000 value can be melted at once, but if the amount exceeds this, one or more No. 100 crucibles may be used, making two bars from one heat. When the metal has set, a little cold water is poured on to chill the slag, which is then removed with a scraper or hook. The bar is then put into dilute nitric acid, washed in cold water and scoured with wet sand. After being rinsed and dried it is sampled by drilling opposite corners, weighed to 0.01 oz. and delivered to the U. S. Assay Office. The loss in melting the crude bullion is about 0.66% and in remelting at the Assay Office there is an additional loss of about 0.04%.

Pulp is Classified in Cones

In the line of flow from the stamp mills to the classification department, there are placed at convenient points screen houses, which are for removing chips, fragments of wood, small pieces of rock, and other foreign material which may get into the pulp. The tailing launders discharge into a sump from which the pulp is distributed to a battery of 14 gravity cones, each four feet in diameter with 70° slope. These cones carry relatively small discharge bushings and are heavily fed, their overflow carrying about 88% of the tailing, including much fine sand and some coarse material, the latter low in gold and sulphur content. The discharge of the gravity cone is connected by means of a hose to the feed of a concentrating cone which enters the side of the cone through a gland at a point near its apex and discharges the sand in an ascending stream at its axis, while water at about 30 lb. pressure is introduced below the entry point of the pulp. The concentrating cones are 16 in. in diameter with 80° slope.

The overflow from both the concentrating cones and the gravity cones forms the main stream which goes to

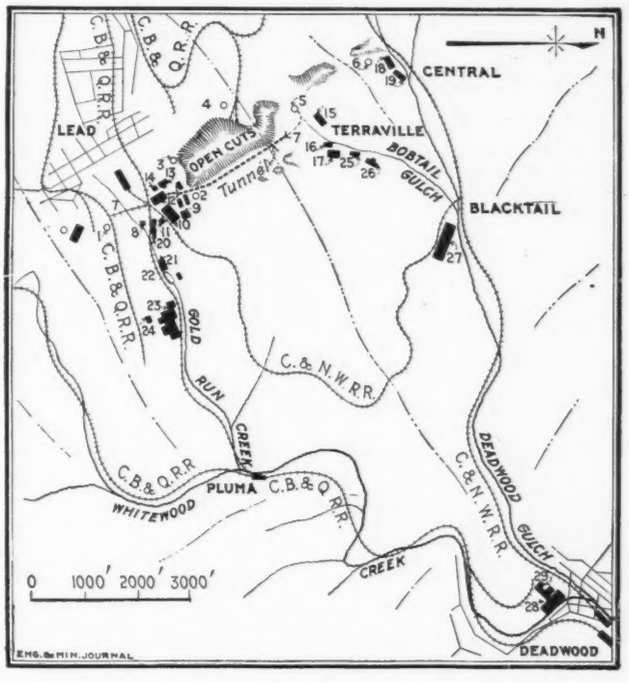


FIG. I.—SKETCH MAP OF LEAD DISTRICT, SOUTH DAKOTA

0. Main Reservoir (alt. 5400 ft.)
1. Ellison Shaft.
2. B. & M. (Old Abe) Shaft.
3. Golden Star Shaft.
4. Golden Prospect (Highland) Shaft.
5. Old Brig (Terra) Shaft.
6. Golden Gate Shaft.
7. Homestake Tramway (altitude 5200 ft.)
8. Assay Office (5080 ft.).
9. Foundry and Shops.
10. Amicus Mill and (11) Plate House.
12. Golden Star Mill.
13. Homestake Mill and (14) Plate House.
15. Pocahontas Mill and (16) Plate House.
17. Monroe Mill and Plate House.
18. Mineral Point Mill and (19) Plate House.
20. Regrinding Plant, Cone-House 1 and 2, and Clarifying House A.
21. Clarifying House 1.
22. Dam and Pump House (5016 ft.)
23. Sand Cyanide Plant No. 1 and Clarifying House 2.
24. Lime Bins.
25. Terraville Cone House.
26. Terraville Clarifying House.
27. Sand Cyanide Plant No. 2 and Northside Clarifying House.
28. Slime Cyanide Plant (4550 ft.)
29. Lime and Solution Houses.
C. & N. W. R. Chicago and Northwestern Railway.
C. B. & Q. R. R. Burlington Railroad.

the classification system. The discharge from the cones goes to the regrinding machines. Table IV shows a typical grading analysis of the products of the cones.

The separation of the pulp into sand and slime is done in sheet-iron cones with peripheral overflow. The slope of the sides varies from 50° to 80° from the horizontal, the present tendency being to use a steeper slope than formerly. The overflow edge of the cone is formed of a strip of wood or lead which can readily be leveled by planing. The feed is central and the incoming pulp is usually conducted a little below the surface of the contents of the cone.

In the South or Lead system, there are four series of cones, the underflow of each passing to the next series and the overflow of each being considered as slime. The first three batteries are all simple gravity cones, while the last series has an annular hydraulic inlet feed admitting a stream of clear water immediately above the dis-

charge bushing. Table V shows the details of this equipment.

Regrinding in Tube Mills

Regrinding was formerly performed both in pans of the Wheeler type and in a tube mill, but experiments have shown that the tube mill has advantages over the pans and the latter have been discarded, the tube-mill installation having been increased and all regrinding being done in them.

TABLE IV—GRADING ANALYSIS OF CONE PRODUCTS, REGRINDING SYSTEM

Grade	Gravity Cone Overflow %	Gravity Cone Overflow Gold per ton	Concentrating Cone Overflow %	Concentrating Cone Overflow Gold per ton	Concentrating Cone Discharge %	Concentrating Cone Discharge Gold per ton
+50 mesh	....	....	....	....	47.0	$2.00
+80 mesh	5.5	$1.09	12.5	$0.53	34.0	2.97
+100 mesh	3.5	1.45	11.0	0.88	10.0	4.66
+200 mesh	22.0	1.36	28.0	1.36	6.0	5.40
−200 mesh	69.0	1.36	48.5	1.22	3.0	4.43
Average	100.0	1.35	100.0	1.14	100.0	2.87
% of total tailing	88.0	....	4.5	....	7.5	....

The original tube mill was 5x14 ft., motor driven, running at 27 r.p.m. and consuming 37.5 hp. in grinding 73 tons per day. Table VI shows a summary of results of grinding operations. The reground product is passed over another amalgamating plate in order to recover any additional gold freed during the grinding.

TABLE III—DISTRIBUTION OF RECOVERY IN HOMESTAKE STAMP MILLS FOR FOUR MONTHS, MAY-AUGUST, 1910

Amalgam from	Retort Percentage	Percentage of total Mill Recovery Value	Value (Gold only) of 1 oz. Amalgam	Crude Bullion	Refined Bullion	Fineness of Refined Bullion Gold	Silver	Ratio, Silver / Gold	Silver Value expressed as percentage of Gold Value
			$	$	$				
Batteries	43.8	49.44	7.33	16.76	16.84	814.5	175.5	0.215	0.52
First row plates	28.1	37.51	4.58	16.32	16.48	797.5	180.5	0.226	0.55
Skimmings	20.7	4.05	3.29	15.95	16.10	779.0	186.0	0.237	0.57
Trap sands	22.4	1.47	3.52	15.68	15.83	766.0	215.0	0.280	0.68
Silvered Plates:									
Second row	23.8	4.37	2.80	11.73	11.84	573.0	418.0	0.730	1.77
Third row	25.7	2.28	2.97	11.56	11.67	564.5	425.5	0.755	1.83
Fourth row*	24.4	0.90*	2.69	11.02	11.13	538.5	451.5	0.839	2.03
All sources	32.5	100.00	$5.20	$16.00	$16.12	780.0	205.5	0.263	0.67

* Less than half of the batteries (440 stamps out of 1000) are equipped with a fourth row of plates.

TABLE V—CONE AND TANK EQUIPMENT

	No. 1 Plant and Lead System			No. 2 Plant and North-side System			Slime Plant		
Number of stamps served	640			360			1000		
	No.	Diam. Ft.	Angle	No.	Diam. Ft.	Angle	No.	Diam. Ft.	Angle
Iron Cones.									
Regrinding—									
Gravity cones	14	4	70	..	..	..	...	..	..
Hydraulic cones	14	1.33	80	...	..	..	...	..	..
Classification—									
Gravity cones	16	10	50	6	10	50	...	..	..
Gravity cones	21	7	50	7	7	50	...	..	..
Hydraulic cones	36	3.5	60	10	4	70	...	..	..
		Depth Ft.			Depth Ft.			Depth Ft.	
Cone-bottomed tanks for classifying and thickening—									
At Regrinding	1	18	20	...	..	..	...	..	..
At Cone Houses	3	18	20	1	30	24	...	..	..
At Cone Houses	6	18	16	...	..	..	...	..	..
At Cone Houses	13	26	20	13	26	24	...	..	..
At Cyanide 1	1	20	20	...	..	..	...	..	..
Sludge tanks at slime plant	1	26	24	1	26	24	...	..	..
Sludge pressure tank	..	..	..	...	..	..	1	16	15
Vats and Tanks—									
Sand leaching vats	20	44	9	5	54	13	...	..	..
Solution sumps	4	26	19	4	22	17	4	24	17
Solution sumps	2	25	5	...	..	..	...	..	..
Solution storagetanks	2	44	9	2	38	9	2	32	13
Water storage tanks	2	25	18	1	50	12	2	32	13
Water storage tanks	1	30	24	1	30	19	1	26	21

Oxidation of Ore Essential

In cyaniding the tailing from the mills the practice of treating sand and slime separately is followed, and in each case it is a point of vital importance that the charge be thoroughly aërated. This is on account of the presence of ferrous compounds, which must be oxidized to avoid their detrimental effect on the process. Table VII shows the consumption of oxygen as determined by laboratory experiments.

This aëration is common to all the plants and operations are closely parallel within the limits imposed by the nature of the material. The general operations may be stated as follows:

(1) Drainage of surplus water from the charge in order that it may be in best condition for aëration.

(2) Aëration. This precedes the application of cyanide solutions and oxidizes and renders harmless ferrous compounds, which would otherwise destroy cyanide. Without aëration the consumption of cyanide is nearly doubled.

(3) Leaching with cyanide solution until the supply of oxygen is nearly exhausted.

(4) Repeating the foregoing cycle either once or twice with variation of time of each operation according to the character of the charge.

(5) Passage of solution through two charges before precipitation, thus concentrating the dissolved gold and silver in a portion of the solution from which it is precipitated by the Merrill zinc-dust method.

(6) The segregation of the first and final effluent solutions from the main body and precipitating this low-grade solution separately, finally wasting it, this having proved the most economical method of disposing of the excess volume accumulated by imperfect displacement.

TABLE VI.—SUMMATION OF RESULTS AT REGRINDING PLANT: THREE-MONTH PERIOD, 1910

	Pans (12,308 tons ground by seven pans)		Tube-Mill Regular Adjustment, Medium feed		Tube-Mill Special Adjustment, Heavy feed	
Total tons ground per day	19.34 per pan		73		110	
Tons ground per day to pass 100 mesh	10.83 per pan		43		52.8	
Water in feed: per cent	80–90		38.0		38.4	
	Heads	Tails	Heads	Tails	Heads	Tails
Assay: Gold per ton	$2.66	$2.07	$2.49	$2.04	$2.49	$2.04
Sizing test: per cent. +50 mesh	47	6	39	5	18	7
+80 mesh	34	14	38	12	49	15
+100 mesh	9	14	12	13	17	14
+200 mesh	6	26	7	28	11	26
−200 mesh	4	40	4	42	5	38
Tons ground per hp. per day: at one passage through grinder	2.30		1.94		2.92	
to pass 100 mesh	1.31		1.14		1.40	
to pass 200 mesh	0.83		0.74		0.97	
Material consumed: lb. per ton	Iron: worn 3.41; scrapped 0.82 total 4.23		Pebbles 1.66		Pebbles 1.30	

Sand Treated by Leaching

The sand is deposited in tanks of large diameter and comparatively shallow, the Lead plant having tanks 44 ft. diameter and 9 ft. deep. The tanks have filter bot-

toms of coconut matting and 8-oz. canvas. The tanks have side gates at the level of the filter and there is a circular center discharge gate. The tanks are filled by means of a Butters & Mein distributor, one of which serves each row of tanks. Pipes carrying strong and weak solution and water run at convenient points and are connected to a manifold which allows delivery at four points about the tank.

TABLE VII—LABORATORY EXPERIMENTS ON SELECTED SAMPLES SHOWING CONSUMPTION OF OXYGEN

Nature of Ore	*Oxygen absorbed, calculated as cu.ft. free air at Lead. Per ton of ore	*Oxygen absorbed, %
Mixed ore: quartz and chlorite, with some pyrrhotite and a little arsenopyrite	71	0.049
Chlorite, much arsenopyrite, little pyrrhotite and pyrite	86	0.06
Magnesium-iron carbonate, some arsenopyrite and pyrrhotite	86	0.06
Hornblende, with little sulphide	134	0.093

* Determined as chlorine absorbed from a 1% solution of bleaching powder. In all tests the ore had been reduced to pass 30-mesh sieves, and was in contact with the bleaching powder for two hours.

Aëration of the charge is accomplished by introducing air under the filter mat at a pressure slightly in excess of that of the column of sand through which it must pass. The charge is thoroughly drained before the air is applied and each tank is provided with an air gage so that excessive pressure may not be used. Too high pressure induces channeling in the charge. Any layers of slime deposited in the tanks will retard and may even prevent any passage of air, with a resulting poor extraction.

Treatment with solution is followed by a washing period and the sand is finally sluiced out of the tanks with a water stream. At the No. 1 plant two men discharge 590 tons of sand in 2½ to three hours, using 1.3 tons of water for each ton of sand. At the No. 2 plant, having deeper tanks, two men discharge 1250 tons of sand in 4½ to 5½ hours, and use only 0.7 ton of water for each ton of sand.

At No. 1 plant about 1600 tons of sand are treated daily and at No. 2 plant about 800 tons. The former uses 93 hp. and the latter 32 hp., most of which is used for

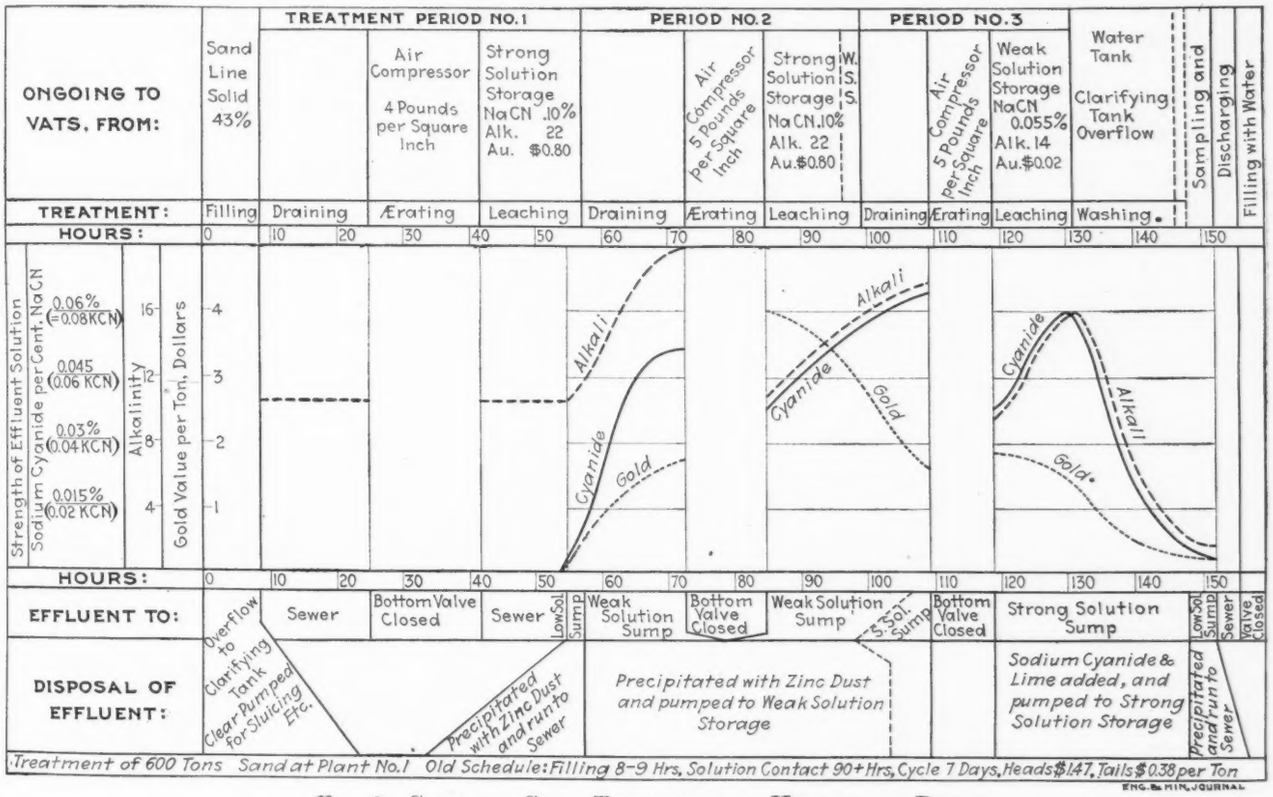

ONGOING TO VATS. FROM:
Sand Line Solid 43%
TREATMENT PERIOD NO.1
PERIOD NO.2
PERIOD NO.3
Air Compressor 4 Pounds per Square Inch
Strong Solution Storage NaCN .10% Alk. 22 Au. $0.80
Air Compressor 5 Pounds per Square Inch
Strong Solution Storage NaCN.10% Alk. 22 Au.$0.80
W. S. S.
Air Compressor 5 Pounds per Square Inch
Weak Solution Storage NaCN 0.055% Alk. 14 Au.$0.02
Water Tank
Clarifying Tank Overflow
Sampling and
Discharging
Filling with Water
TREATMENT: Filling Draining Ærating Leaching Draining Ærating Leaching Draining Ærating Leaching Washing.
HOURS: 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
Strength of Effluent Solution Sodium Cyanide per Cent. NaCN
0.06% (=0.08KCN)
0.045 (0.06 KCN)
0.03% (0.04 KCN)
0.015% (0.02 KCN)
Alkalinity
Gold Value per Ton, Dollars
Alkali
Cyanide
Gold
EFFLUENT TO:
Overflow to Clarifying Tank Clear Pumped for Sluicing Etc.
Sewer
Bottom Valve Closed
Low Sol. Sump
Weak Solution Sump
S. Sol. Sump
Strong Solution Sump
Valve Closed
DISPOSAL OF EFFLUENT:
Precipitated with Zinc Dust and run to Sewer
Precipitated with Zinc Dust and pumped to Weak Solution Storage
Sodium Cyanide & Lime added, and pumped to Strong Solution Storage
Precipitated and run to Sewer
Treatment of 600 Tons Sand at Plant No.1 Old Schedule: Filling 8-9 Hrs, Solution Contact 90+ Hrs, Cycle 7 Days, Heads $1.47, Tails $0.38 per Ton
ENG. & MIN. JOURNAL

FIG. 2. CYCLE OF SAND TREATMENT AT HOMESTAKE PLANT

Below the filter are three openings with valves, which deliver strong and weak solutions to their respective sumps, the third leading either to the low sump or to the sewer. The amount of free cyanide contained by the first and final solutions determines whether they shall be sent to the low sump or the sewer, and these are sampled below the tank as they come from the charge.

It is customary to fill the tanks with clear water before starting the pulp flow in order to get rid of the small amount of slime carried in the pulp, but this operation is not essential. The overflow from the tanks is elevated to a combined storage and clarifying tank, where slime amounting to about 20 to 25 tons per day is settled and conveyed into the main pipe line leading to the slime plant.

compressing air. Fig. 2 gives the details of sand treatment.

LIME CRUSHED IN A ONE-STAMP MILL

The lime used in sand treatment is crushed in a small one-stamp mill through a 9-mesh screen having 0.076-in. aperture. A supply equal to two hours' consumption, calculated at the rate of four to five pounds per ton of ore, is previously broken in a jaw crusher and weighed into a Challenge feeder adjusted to that time. The discharge from the lime mortar joins the stream of pulp discharged from the hydraulic cones. A low alkalinity is essential, it having been shown that more than 0.3 lb. CaO per ton of solution retards the dissolution of the gold and it is desirable that the alkalinity be retained at a nearly uni-

form strength of about 0.15 lb. CaO per ton of solution. This is accomplished by the method of preparing the lime and on account of the size of the lime particles, the loss of lime in water overflowing while filling is reduced to a minimum. During drainage periods a small quantity of lime is added to the top of the charge, about 0.4 lb. per ton, and about 0.1 lb. per ton is added to the ongoing solution. This can be varied in quantity or omitted in case the early effluents show high alkalinity. Lime determinations in residues show that less than 0.2 lb. per ton remains undissolved after treatment.

The formation of carbonates occurs during treatment, due partly to aëration of alkaline charge, but principally to the character of the water used, which contains bicarbonates of lime and magnesia. Lime cannot be fed to the batteries, as a deposit of calcium carbonate and iron is formed on the plates in less than an hour.

Deposits of lime formed on filter bottoms and in other places are removed from time to time by treatment with hydrochloric acid. The filters are treated directly with weak acid and afterward thoroughly washed off.

(To be concluded)

❋

Coal and Coke in 1912

The coal and coke production of the United States in 1912 made a new record, notwithstanding a decrease in anthracite production due to labor troubles. For the first time it passed the 500,000,000-ton mark. The accompanying table gives the production for two years past as ascertained by *Coal Age*.

COAL AND COKE PRODUCTION OF THE UNITED STATES

(In short tons)

	1911	1912	Changes
Anthracite	90,526,556	84,308,437	D. 6,218,119
Bituminous	402,121,307	427,655,966	I. 25,534,659
Total coal	492,647,863	511,964,403	I 19,316,540
Coke made	34,472,534	41,803,199	I. 6,830,665

The bituminous coal trade began the year laboring under difficulties, due to the severe winter, with its increased demand and diminished transportation facilities. As spring advanced the market gradually quieted down. There was some delay in April in settling the wage scales for the year, but they were finally adjusted without much difficulty and the production proceeded steadily until in the latter part of the summer there was an actual surplus of supplies with corresponding low prices. Later the strong demand for steam coal helped out the market and therefore prices improved. The great trouble in the last two or three months of the year has been the scarcity of cars and the difficulty of getting coal to the consumers as promptly as it was demanded.

The production of anthracite decreased in 1912, not because of any lack of demand, but in consequence of a stoppage of two months in April and May, while a discussion over the mining agreement was going on. This made a deficit of some 12,000,000 tons, and though the collieries were worked at a quick pace during the remainder of the year, the companies were unable to make up the shortage completely. In the table, the anthracite production is reduced to short tons for purposes of comparison.

The coke market and production improved steadily throughout the year in consequence of the activity in the iron trade, which is the chief consumer of this fuel. At the close of the year the coke ovens are reported as unable to meet the demands, and prices of coke have nearly doubled since January.

Export trade showed some improvement, especially to South American countries, while some large contracts for delivery to Italy in 1913 have been reported. The steamship or bunker trade, which takes about one-third of our exports, was remarkably good throughout the year.

❋

Steel Corporation Ore Shipments

By Dwight E. Woodbridge*

The shipments of ore from the Lake Superior Region by the Steel Corporation for the 1912 season are given in the accompanying table. In addition to the amounts given there was, on Dec. 1, a little ore going forward all rail from the Lake Superior, Queen and Iron Ridge mines, so that the year's figures will exceed the given total by a small amount.

Total shipments out of properties in which the Great Northern road is interested amounted to 9,939,762 tons, but in the case of some of these the Great Northern owns or controls but a half interest, so that the actual tonnage shipped under the Great Northern lease for the year was a little more than 8,000,000 tons. The minimum for the year was 4,500,000 tons, so that this tremendous shipment takes up some 3,500,000 tons of previously accrued and paid for minimum. As there were at the commencement of this year, total unshipped minimums of 3,680,000 tons, the Steel Corporation is now about even on Great Northern ore, and has taken out practically all the ore on which it has paid royalties. Minimums accruing under the Great Northern lease to its conclusion amount to 11,250,000 tons, and if the Steel Corporation is able to mine as rapidly in these two years ahead as it has this season, it will close the term with an excess over minimum requirements amounting to no less than 8,000,000 tons. Two years ago such a consummation would not have seemed possible. It is believed that the average royalty and freight paid this year under this lease has been about $1.79, which is 3c. below the standard base. As the freight rate this year is but 60c., the actual royalty paid amounts to $1.19. Under the former rate of freight to Lake Superior the royalty would have been 99c. a ton, or $1.02 for the 59% standard base ore.

STEEL CORPORATION ORE SHIPMENTS

Marquette:		**Mesabi:**	
Lake Superior	219,763	Hull-Rust	2,232,180
Queen	351,916	Winifred	94,806
Stegmuller	50,963	Clark	498,183
Total	622,652	Chisholm	622,911
Menominee:		Glen	15,932
Aragon	244,812	Myers	101,558
Chapin	327,999	Adams	992,065
Iron River	17,302	Spruce	740,229
Riverton	175,943	Fayal	458,583
Total	766,056	Genoa	1,314,719
Gogebic:		Gilbert	135,625
Atlantic	142,186	Alpena-Sauntry	1,025,301
Aurora-Norrie	1,500,758	Norman-Virginia	618,565
Tilden	158,191	Dale	1,104,894
Puritan	90,683	Harold	187,346
Plumer	47,578	Mace	136,282
Total	1,939,396	Mississippi	374,406
Vermillion:		North Uno	534,215
Pioneer	647,336	South Uno	1,305,278
Savoy	90,587	Leonard	2,194,114
Sibley	302,183	Canisteo	2,097,406
Soudan	88,714	Holman	915,969
Smith	477,318	Hill	1,186,252
Total	1,613,168	Two trespasses	528
		Total	18,869,145
Grand total			23,810,227 tons.

*Mining Engineer, Sellwood Building, Duluth, Minn.

Speiss as a Precious Metal Collector

SYNOPSIS—An account of experiments having in view the substitution of speiss for matte as a precious-metal collector. The speiss first formed was roasted, remelted, and the enriched product cupelled with lead to give gold bullion.

The experiments described in the ensuing paper were made at a smeltery which aimed to produce a low-grade copper matte high in gold that was shipped for subsequent refining. It had been noticed that when small amounts of speiss were formed in the smelting, the value of the matte in gold decreased. Consequently, it had always been the practice to keep the speiss formation at a minimum. The experiments were conducted on the idea that the formation of speiss, if it could be controlled, would constitute a means of collecting the gold and recovering the bulk of the precious metal immediately.

The first experiments were conducted in the reverberatory furnace used for smelting operations, but it was found that the speiss formed could not be tapped out owing to the state of the furnace bottom, so that other means must be tried and, eventually, the precipitation of a speiss while tapping the matte was adopted. The process may be divided into six stages: (1) Calcining and smelting with copper ores; (2) tapping, with the formation of speiss; (3) remelting and granulating the speiss; (4) sintering roast; (5) smelting sintered speiss to remove copper; (6) cupelling enriched speiss with lead.

Calcining and Smelting Operations

The products smelted were raw concentrates, roasted concentrates and slime from a previous method of treatment, copper ore and limestone flux. The roasted concentrates and slime formed the greatest proportion of the charge. Before smelting, however, they were mixed with a raw concentrate and recalcined.

ANALYSIS OF MATERIAL SMELTED.

	Raw Concentrates %	Roasted Concentrates and Slime. %	Copper Ores %	Limestone %
SiO_2	13 to 33	40 to 49	14.9	7 to 19
Fe	29.8	29	38.54	.....
S	26 to 30	0.31	25.26	.....
As	14 to 20	1.4	.....	.....
Cu	.....	.....	7.79	.....
MgO	.....	.....	4.8	.....
Au	3 to 5 oz.	1 to 1½ oz.	.....	.....
Ag	tr.	tr.	.....	.....
Sb	1.4 to 3.7	1.4 to 2.7	.....	.....

The limestone flux was but little more than self-fluxing. The coal was of poor quality, carrying 25% of ash, giving a short flame and no coherent coke. The usual method employed in smelting was to form a bath of matte, either from uncalcined copper ore or matte from a previous tapping, and on this was charged the hot auriferous material from the roaster mixed with a small amount of raw copper ore and limestone; charging was continued until the matte assayed from 40 to 60 oz. of gold per ton.

The original bath of matte varied both in gold and copper content, according to the material which had been smelted to form it; if copper ore alone was used, the bath assayed from 12 to 14% copper and 7 oz. of gold per ton; with matte, both gold and copper contents were higher, depending upon the assay of the matte charged; consequently, the time taken to bring up the assay in gold to an average of 50 oz. per ton varied accordingly. Usually, the furnace is only tapped once a week, the slag assays from 0.05 to 0.25 oz. per ton of gold.

The higher assays occur when the bath is up to 40 oz., or were sometimes due to balls of fine, unsmelted slime, which at times were found disseminated through the old heaps of roasted residue. The following is an analysis of a typical slag: SiO_2, 41.2; FeO, 36.2; CaO, 12.8; Al_2O_3, 5.95; FeO, 1.44; Sb, 1.32; Cu, 0.18 per cent.

Precipitation of Speiss

The precipitation of speiss was effected by running the matte from the furnace over scrap wrought iron placed in sand beds. The antimonial speiss formed, carried a large proportion of the gold down with it. As might be expected, the formation of speiss decreased with an increase of copper, even though a larger amount of antimony was present in the higher grade matte, until the point was reached when little precipitation took place. Also with an increase in copper content, the character of the speiss obtained altered and caused it to be more difficult to treat in the subsequent operation.

EFFECT OF INCREASED COPPER ON PRECIPITATION.

Experiment No.	Before Precipitation Copper	Before Precipitation Gold	After Precipitation Copper	After Precipitation Gold
1	11.1	33.3	....	6.2
2	31.9	57.3	....	18.75
3	34.3	40.0	....	25.3
4	41.3	48.0	41.3	38.5
5	45.7	54.0	....	47.5

In the case of No. 4 sample, the antimony before precipitation was 2.4. The antimony after precipitation was 2.07. From this it can be seen that the lower the percentage of copper the better the gold recovery, and that with matte above 32% of copper, the gold recovery is small. An experiment was made to see if matte No. 4, after precipitation, would decrease in gold content if given a longer exposure to iron. The results showed a reduction of copper of 1% and of antimony of 0.82%, with a reduction in gold from 38½ oz. per ton to 10.3 oz. per ton. The speiss obtained in the sand bed while tapping No. 4 matte contained 1783 oz. of gold per ton, and that which was given by longer exposure to the action of the iron contained 512 oz. per ton.

A complete analysis of a speiss obtained by precipitation is as follows: Sb, 52.26%; As, 4.51; Cu, 18.90; Fe, 5.20; Ni, 10.30; Pb, 5.30; Ag and Au together, 3.60; S, 1.05%. This analysis was made after the speiss had been remelted and separated from matte and sand.

The speiss formed in tapping settled at the bottom of the pigs of regulus in the sand bed, mixed with the unused iron, and, when cold, was separated from the matte above and passed on to the next operation, the matte being returned to the reverberatory furnace, as it was required in making up a fresh smelting bath.

Remelting and Granulating Speiss

The object of remelting and granulating the speiss was to separate it from the matte and sand of the beds and

Note—Abstract of a paper entitled "Notes on the Collection of Precious Metals as Speiss in the Smelting of Antimonial Concentrates," by G. C. McMurtry, Bull. No. 97, I. M. M.

was done by melting in blacklead pots or in the cupelling furnace, which was erected for the gold refining. Granulating was done by remelting the bars of clean speiss in a large blacklead crucible, dipping it out with a small pot and pouring it into water. At one time the speiss was crushed instead of granulated, but the latter process was found to be cleaner and quicker.

Roasting

The sintering roast was carried out in a small conical pot holding about 40 lb. of material. With a speiss of the composition given above some trouble was experienced before the difficulty of roasting was overcome, as such speisses would not burn after merely moistening. Eventually, the process adopted was to mix the granulated speiss with half its weight of siliceous arsenical concentrates, a handful of fine coal being added to each 21 lb. of the mixture and the whole thoroughly wetted. A fire was started on some small pieces of sintered concentrates, which covered the false bottom of the pot, and prevented any speiss that melted from blocking the holes; the fire was allowed to burn down somewhat, and the mixture charged a little at a time, using a light blast. When this had burned through in several places, more mixture was added until the pot was half full. The blast was then increased and larger amounts added until the pot was entirely filled. The time occupied in burning a charge of 40 lb. with a mixture of speiss and arsenical concentrates was 1½ hour.

An advantage was gained by mixing a small portion of burnt speiss with the fresh charge, as by so doing the subsequent roasts could be much more easily managed. The mixture also burns more quickly with less attention to the regulation of the blast pressure. On breaking the sintered cones, it was usual to find patches of copper matte formed during the roast, and on one occasion a shot of an alloy of copper and gold was discovered.

The fume given off was dense at first, composed largely of sulphide of arsenic from the concentrates, after which followed the white fumes of Sb_2O_3. This became marked toward the end of the reaction, when the charge was hot all over. The addition of a small amount of coal helped in splitting up the antimonates present, or formed during the roasting, for, when omitted, the final result was not so satisfactory. This roast was to convert the copper and iron in the speiss into such a form that they could be removed in the next operation; also to eliminate some of the arsenic and antimony.

Remelting Sintered Speiss

The speiss was remelted to remove the copper and iron and to obtain a speiss rich in gold. Remelting was carried out either in pots or in the cupelling furnace. The sintered speiss was first broken, mixed with an equal amount of copper ores, also a small amount of cyanide slag and sand and then melted. At first sight it seems an anomaly to add copper ore for the purpose of extracting copper. It is, therefore, necessary to explain that this was the only source of sulphur available, except the arsenical and antimonial concentrates. It would have been better to use iron pyrites, but this was unobtainable anywhere in the district. The result of the operation gave an enriched speiss, copper matte and slag. The slag was skimmed off, and the speiss and matte poured in the molds, the two being separated when cold.

The product from this treatment of the speiss of the analysis given above, analyzed as follows: Sb, 59.42%; As, 10.12; Cu, 4.40; Ni, 12.60; Fe, 0.77; Sb, 0.10; S, 2.70; Au and Ag, 10% equal to 3266 oz. per ton. The matte obtained carried copper, 22%; gold, 49.15 oz. per ton. The approximate weights of the first speiss to the enriched product were as 3:1.

An experiment to see if the copper could be removed without first sintering by simply melting the speiss with copper ore, only brought the gold value of the speiss up from 1212 oz. per ton, to 1737 oz. per ton.

Cupelling with Lead

The cupellation with lead was divided into two stages, first forming an enriched lead bullion; second, refining to gold. Both operations were performed in a small English cupel which was erected for the work, the test rings being filled with a mixture of 1:1 siliceous limestone and portland cement, damp-rammed and the cavity cut out. For the first part a water-jacketed tap hole was used, but the refining was finished on a test furnace with a solid breast.

This first part of the work was carried out by filling the cupel with lead, starting the cupellation, then adding the enriched speiss a little at a time, with the addition of fresh lead as required until the bath contains 20% of gold or over, upon which it was tapped. The second operation brought this enriched lead to refined gold and needs no comment. The cake of gold was broken while still hot, transferred to a plumbago pot for remelting, and cast into ingots.

It would seem better if the speiss could have been run down with litharge, reducing that to lead and then cupelled, but the closing down of the smelting plant preventing this from being tried on a large scale. Adding the speiss to a mass of lead while cupelling offers certain difficulties, thickening up the litharge to such an extent that at times it refused to run, while the extra heat required for this purpose helps the scouring oxide to attack the test filling. In conclusion, the author states that knowing the difficulties both in refining and in the treatment of anode slime from copper containing antimony, he believes that the method may have some application in removing some of the antimony before the copper reaches the electrolytic department. It has the additional advantage that some of the gold can be recovered in a short time by this method with an accompanying saving in interest charges.

❋

Vanadium in 1912

In 1912 the vanadium production of the United States was practically confined to the Colorado-Utah localities already established as important sources. The Primos Chemical Co. treated about 35 tons daily during the year from the vanadiferous-sandstone deposits of San Miguel County, Colorado. Satisfactory improvements in the metallurgy are reported. The Colorado Vanadium Co. did extensive development in this district.

Another source of vanadium is from the carnotite deposits of Colorado and Utah, which have been exploited on a moderate scale for several years as a source of uranium to supply radium salts. This ore runs from 5 to 8% in the combined oxides. Part of the output was

treated at the plant of the American Vanadium Co. at Pittsburgh, and the rest shipped abroad, mostly to Liverpool. The total shipments of carnotite did not exceed a few hundred tons. The attempts to treat the vanadinite ores of New Mexico and Arizona were suspended, presumably on account of metallurgical difficulties. Some small shipments of vanadinite from the Southwest and from Mexico have been made to European plants, where the Australian and Spanish vanadium ores are also received in small amounts.

The chief source of vanadium for the world continues to be from the Peruvian mines belonging to the American Vanadium Co., of Pittsburgh. This company claims to have made important advances in the treatment of these high-grade vanadium-sulphide ores. It has conducted extensive and successful investigations of the applications and advantages of vanadium steel. The price of ferrovanadium for 1912 ranged between $2.25@2.50 per lb. for the vanadium content, with somewhat stronger prices toward the close of the year.

❖

Petroleum in Texas in 1912

By Holland S. Reavis*

Texas produced 11,778,324 bbl. of crude petroleum in 1912, making a gain of over 2,000,000 bbl. over the 1911 record, which was 8,845,396 bbl. The increase came entirely from the new light-oil territory in the Electra district, Wichita County, situated in the northern part of the state, a few miles south of Red River. This field, first developed in April, 1911, is credited with 4,647,180 bbl. in 1912, as compared to 899,579 bbl. in 1911. The older coastal districts of Texas produced 6,551,220 bbl. in 1912, as against 7,275,281 bbl. in 1911, practically all heavy oil; Powell, in Navarro County, produced 301,143 bbl. of heavy oil, as compared to 373,055 bbl. in 1911; Corsicana, in Navarro County, produced 105,333 bbl. of light oil, as compared to 128,526 bbl. in 1911, and Petrolia, in Clay County, east of Electra, produced 173,448 bbl., as compared to 168,965 bbl. in 1911.

While the production of heavy crude in the state declined from 7,648,336 bbl. in 1911, to 6,852,363 bbl. in 1912, the output of light crude rose from 1,197,060 bbl. in 1911 to 4,925,961 bbl. in 1912, entitling Texas to seventh place in the list of states which produce oil of good refining quality.

Electra Developments Now Cover 5000 Acres

The most interesting oil development in Texas in 1912 was in Wichita and Clay Counties, in the northern part of the state. Electra, in Wichita County, was the scene of continuous activity throughout the year, with an average of from 60 to 70 drilling rigs constantly in operation. On Jan. 1, 1912, the daily average production of this field was 11,242 bbl.; one year later it was 15,050 bbl. The average daily yield per well on Jan. 1, 1912, was 208 bbl., and on Dec. 31, 1912, it was about 51 bbl. The lowest average daily production, 8441 bbl., was in March, and the highest, 16,150 bbl., in November.

At the beginning of the year the proved area of the field was estimated at 820 acres. At its close it covered about eight sections, or more than 5000 acres, lying in an east and west strip, in length about three times its width. The important extensions were mainly in a due east course from the original Putnam lease of the Corsicana Petroleum Co., although, during the year, the deep sand (1900 ft.) on the Waggoner and Bywaters leases, was opened up and proved to be, perhaps, the most consistent and profitable producing formation of the field.

During the first five months of 1912 the district was without pipeline transportation, and all the production except that handled in tank cars, was run into steel storage. Stocks on Jan. 1, 1912, were 373,500 bbl.; on July 15, the maximum figure, 1,360,000 bbl., was reached; since which there has been a steady decrease to 1,044,000 bbl., the present storage figure. During the latter part of April, the Texas company began delivering oil to Henrietta through a 6-in. line, which, one month later, was completed and in operation through to the company's Dallas refinery. The Magnolia Petroleum Co.'s 8-in. line to Corsicana and Beaumont, with a capacity of 15,000 bbl. per day, was put in operation throughout its entire length early in August. This line is about 450 miles long.

The gas field, at Petrolia, has furnished several 25 to 30 million-foot gassers, all located, however, in the vicinity of the earlier development. In April a new deep oil sand was discovered about a mile southwest of the town by the Developers' Oil & Gas Co., the first deep well since the completion of the J. M. Guffey Petroleum Co.'s No. 1, Dunn. It started flowing about 100 bbl. per day and later pumped that amount with great regularity for some time, which led to the belief that the sand might be more uniform than elsewhere in the field. By the end of the year the drilling had shown that the oil sand was local and relatively unimportant—a great disappointment, inasmuch as it was believed that somewhere near the great volume of gas there lay an oil field. In December, a 25-bbl. well was completed three miles west of the town at 1060 ft.; no oil had thus far been found in that locality.

The year started with a vigorous wildcat campaign in progress. Perhaps 30 tests were drilling, strung out at intervals from the Wichita Mountains of Oklahoma, south to the long known shallow oil districts in Brown, Coleman and McCulloch Counties, Texas. Toward the end of the year, the wildcatter's enthusiasm waned, until work is now being actively pushed only in the region adjacent to Electra and Petrolia and around Brownwood. This prospecting has been more than unusually interesting and in several places has been productive of desired results. In other places, just enough oil has been found to lead to the expenditure of enormous sums of money, with scarcely a barrel of production on the credit side of the ledger.

Archer County Disappointing

The first excitement of 1912 was precipitated on March 14, when the Miller well, in Archer County, 40 miles due south of Wichita Falls, developed an oil sand at 950 ft. The well was shut down before the sand was drilled through, and several days later, about 25 bbl. of black, 37° oil was bailed out. It showed no gas, but was accepted as an edge well of a new pool. Trading was active until all available property for miles in every direction had been leased. The Corsicana Petroleum Co. soon thereafter made a trade, acquiring practical control of the most likely looking territory, where before this company had not held a single lease. In the development which

*Editor, "The Fuel Oil Journal," Houston, Tex.

followed, none of the dozen or more tests drilled in the vicinity showed more than a trace of oil, and nearly all were drilled to 2000 ft. or deeper. The locality is now to all intents and purposes abandoned.

The second surprise came in July, when the Corsicana Petroleum Co. finished a 75-bbl. flowing well southwest of Burkburnett, in Wichita County, and about 18 miles northwest of Wichita Falls. Here, too, this company held a large acreage of leases, but this time fared better than in Archer County. The well appeared normal in every respect, with plenty of gas, and oil not dissimilar to that at Petrolia. The sand was about 15 ft. thick, and was found at 1835 ft. Work was rather slow in starting, but at the end of the year the district had about 20 drilling wells and five producing, with a total yield of about 450 bbl. The sand is known to be uniform, since the completion of the W. C. McBride well for at least 1¾ miles southeast, and the wells have all averaged about the same size. This district now furnished the main hope for a second large oil field in north Texas.

In August, the Eeds well was brought in, five miles due east of the nearest production in the Electra field. It, too, flowed with good gas pressure from a 1440-ft. sand, making about 150 bbl. per day, and its production has held up steadily. Yet there have been at least five tests drilled in its immediate vicinity, completely surrounding it, and in every one the pay sand has been missed. The district has been a disappointment to be classed with Archer County, although there is enough work still in progress to find a field if there happens to be any oil near. One and one-half miles northeast, the Interstate Oil & Gas Co. has lately finished a 45-bbl. well at 1275 ft., which, at least, lends some encouragement.

In all the wildcatting except that near Red River, the results have been largely negative. A small oil well was completed at Trickman, in Coleman County, also a second gasser, estimated at around 3,000,000 cu.ft. Although 10 or more wells were drilled on all sides of the shallow production at Lohn, in McCulloch County, no deep oil and little additional shallow oil was found.

At the very close of the year, a 3,000,000-ft. gasser, about 1050 ft. deep, was finished in the northwest corner of Shackleford County, about 30 miles northwest of the two gas wells at Moran, in the same county. Several dry holes were drilled to 3000 ft. in a search for oil near the Moran gas wells.

In south Texas there were no important extensions of producing territory in the coastal fields. Several wells were completed in the 3000-ft. sand north of the Humble district, and near the San Jacinto River. One of these, drilled by the Sun company, started at 1200 to 1400 bbl., and is still a good pumper. Others made heavy flows when first brought in, but soon sanded up and are small producers. A number of operators are continuing tests in the deep sand, however, on the theory that it will eventually prove to be a prolific source of oil production.

In line with the general advance in crude-oil prices, the Texas market strengthened appreciably during the year. In north Texas the price of light oil at the wells on Jan. 1, 1912, was 55c., and heavy oil, 50c. On Dec. 31, 1912, light oil was 88c., and heavy, 70c. Contracts were made Jan. 1, 1912, in the coastal fields for periods of 12 to 18 months, at 72 and 72½c. per bbl. for heavy oil at the wells. Some of these contracts were renewed Jan. 1, 1913, at $1 to $1.07⅞ per bbl., at the wells. South Texas crude oil sold on Jan. 1, 1912, at 70c. per bbl., on board cars, for fuel use. A year later the price was $1.10 to $1.20 per bbl., on board cars.

Louisiana Petroleum Industry

By Holland S. Reavis*

Louisiana's production of crude petroleum in 1912 was 9,791,896 bbl., a decline of over 900,000 bbl. as compared to the state's 1911 yield, which was 10,720,420 bbl. Included in the 1912 figures, as given, is the yield of a few wells in Marion County, Tex., across the line and a few miles distant from the Caddo field in northwestern Louisiana, so that the decrease in the state's output is really even larger than it appears from a comparison of the totals as stated.

The Caddo district, including Marion County, Tex., produced 7,188,514 bbl. in 1912 as against 6,995,826 bbl. in 1911—the 1911 total not taking into account the Marion County, Tex., output. It may be seen, therefore, that Caddo fell behind its 1911 yield. A unique feature of operations in this district was the completion of some good oil wells in the bed of Ferry Lake. The Gulf Refining Co. leased the bed of this lake in 1911 and in order to drill the wells was compelled to drive piling to support the derrick and drilling machinery.

Two or three gas wells were completed in and near the city limits of Shreveport during the year and oil in small quantities was developed in some deep tests south of Shreveport in De Soto and adjoining parishes.

Vinton, in the coastal region of Louisiana, just east of the Texas line, is credited with 1,333,163 bbl. in 1912, as against 2,454,103 bbl. in 1911. The productive area of this field is limited, but recent developments show the presence of a prolific sand below the formation which has heretofore furnished the pool's output. The new deep sand, found at from 2200 to 2400 ft., may repeat the history of the Jennings, La., pool, where 20,000-bbl. wells were completed in formations underlying the sands which supplied the field's production during the first two years of its development. Late in December the Gulf Refining Co., of Louisiana, brought in a gusher in the Vinton deep sand which started at 14,400 bbl. a day. Jennings produced 1.167,219 bbl. in 1912 as compared to 1,180,177 bbl. in 1911. The limits of the Jennings field were not extended.

In February, 1912, a well was completed at Pine Prairie, in Evangeline Parish, La., which flowed for several days at the rate of 1000 bbl. per day. This was in new territory and gave promise of developing an important pool. Later, after the well had been shut in and reopened, it made large quantities of water. A number of tests drilled in the same territory failed to get oil in paying quantities, and the first well is therefore classed as a "freak." The location is close to a mound of rock salt.

Prices advanced materially in Louisiana during the year. On Jan. 1, 1912, Caddo light oil was quoted at 62c. per bbl. at the wells and Caddo heavy oil at 40c. At the close of the year Caddo light was 91c. and heavy 60c. Contracts for the year were made at Jennings Jan. 1, 1912, at 65c. and were renewed Jan. 1, 1913, at $1 for oil at the wells. Vinton contract prices advanced from 60c. to 90c. during the year.

*Editor, "The Fuel Oil Journal," Houston, Tex.

Commercial Movement of Gold

Without going into details, for which there is no space in this review, it may be said that in 1912, as in 1911, the gold production of the year was largely absorbed in commercial channels. The great commercial and industrial activity in the United States, combined with its large crops and its heavy exports of grain, cotton, oil, copper and steel, enabled it not only to hold its own production but to import some $8,500,000 more than it exported, making an increase of about $100,000,000 in its gold stocks. Most of this appears in the Treasury Department's estimate of gold in the United States as of Jan. 1, 1913, which is as follows: Treasury current balance and redemption reserve, $170,983,732; held against gold certificates, $1,084,434,169; in banks and circulation, $623,159,221; total, $1,878,577,122. The total compares with $1,797,721,560 at the close of 1911, showing an increase of $80,855,562 during the year. This estimate seems to be a little excessive, as it hardly allows a sufficient amount for gold used in the arts.

In Europe the industrial conditions were also very active, and in the last four months of the year there was also a strong demand from the banks, owing to the financial disturbances resulting from the Balkan war and the fear that the conflict might extend. To this must be added the fact that the cost and waste of war are great gold absorbers, and it will take some time to settle this disturbance and finally adjust the absolute losses, to say nothing of the heavy adjustments required on the bonuses of almost all Europe. The aggregate gold holdings of the great European national banks at the close of 1912 were reported at $2,513,714,000, an increase over 1911 of $95,016,500 only.

There was a notable increase in the taking of gold by India, the total being approximately $71,000,000, an increase of 35% over 1911. This was evidence of the prevailing prosperity in India and of the tendency in that country to hoard gold instead of silver. Egypt was also a large taker of gold, having received about $38,000,000, or more than twice what it returned.

The visible increases in the United States and the European banks, with the absorptions of India and Egypt, thus account for about $285,000,000 of the production, to which must be added about $60,000,000 taken by Argentina, Brazil and other South American countries, making a total of $345,000,000 and leaving $125,000,000 to be accounted for by use in the arts and by private hoarding. Apparently over 70% of the new gold in 1912 passed into the channels of commerce, though from this must be deducted a large part of the Indian takings, which must be considered additions to the world's reserve hoards rather than to its active currency.

Copper at Chuquicamata, Chile

By Malcolm M. Thompson* and R. A. McGovern†

Among the most recent and extensive prospecting operations in South America, is the work being carried on under the name of the Chile Exploration Co., a Guggenheim subsidiary, in Chuquicamata, Chile, on an ancient and well known deposit of low-grade copper ore, which until recently did not attract any attention from promoting interests.

The property is in the northern part of Chile, latitude 22½° south, in the barren and rainless foothills of the western slope of the Andes; east of the famous nitrate fields of that section and a little to the north of the Atacama Desert, so well described by Darwin in his "Voyage of the Beagle."

Packing Supplies for the Churn Drills at Chuquicamata, Chile

Chuquicamata is about 262 km. from the port of Antofogasta and at an altitude varying from 2500 to 3000 m. The climatic conditions are those customary in an arid country, there being an extreme temperature variation in 24 hours, sometimes as great as 80° F. Precipitation of any kind is a negligible quantity, rain occurring about once in 10 years. One disagreeable feature of this locality is the frequent and decidedly strong and penetrating winds which often, during the winter months, were of sufficient velocity to cause the discontinuance of work.

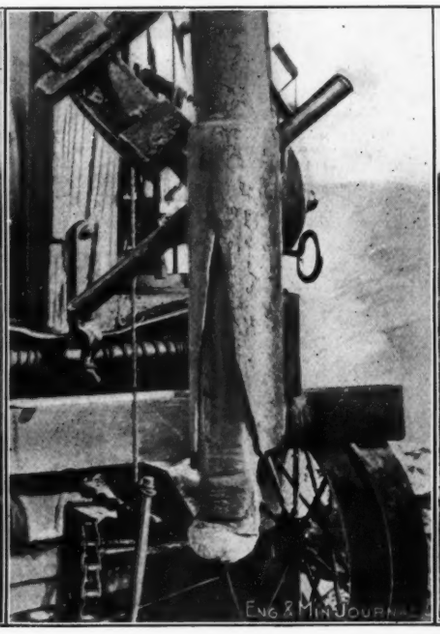
The deposit presents a number of new and interesting features and may in time be of considerable importance as a producer. The mineralized zone is about two miles in length and of a varying width up to a quarter of a mile, running nearly north and south along a ridge which rises abruptly from the pampa.

Mining has been carried on in a crude way for sev-

*Mining engineer, Morsemere, N. J.
†Mining engineer, Pelham Heights, N. Y.

COUNTRY SURROUNDING CHUQUICAMATA, SHOWING THE CAMP OF THE CHILE EXPLORATION CO.

ABANDONED MALACATE AND SCREENING PLANT



CHURN DRILL AND A BIT CORRODED BY COPPER SULPHATE

THE DOMESTIC WATER SUPPLY

AN OLD SURFACE CUT

eral hundred years, the deposit undoubtedly having first been worked by the Indians, who came in search of the bright copper minerals which were used in the making of trinkets for their personal adornment.

No extensive mining has ever been carried on, although there are several old underground workings and numerous large open cuts, which are still worked in a small way by the natives who burrow here and there in the richer portions. They accomplish a partial concentration by hand picking and screening and ship a product containing over 11% copper. The fines from the screening carry considerably more copper than the original ore, due to the fact that the copper minerals are much more brittle than the gangue. However, many of the old dumps run over 1% in copper.

Brochantite as a Commercial Mineral

The chief mineral of importance occurring in the deposit is brochantite, a basic sulphate of copper ($CuSO_4 . 3Cu(OH)_2$) the copper content being about 56%. The mineral occurs in the seams and crevices running in all directions through a highly weathered acid granite. Atacamite, chalcanthite and small quantities of cuprite also occur more or less intimately intermingled with the brochantite. A number of small veins of chalcocite have also been encountered, but mostly in depth, and of no immediate importance.

No satisfactory theory has as yet been advanced as to the origin of the mineralization. The country rock is much faulted and has undergone during comparatively recent geologic time, considerable dynamic disturbance. The ore, however, does not seem to bear any direct relation to the fault seams thus produced, as the gangue material is mostly powdery yellow and red ferruginous clay, practically free from copper. Instead of conforming to the generally accepted ideas of vein or blanket formation, the ore presents the appearance of a general impregnation of the entire country rock.

The copper contents vary between wide limits, and as there is little uniformity in any part of the deposit, ordinary underground mining methods would not be at all applicable. In general, the plan of development, when prospect work is finished and providing a sufficient tonnage is blocked out, will be steam-shovel work on a large scale, the ore to be treated by a suitable leaching plant. The brochantite and atacamite are of so nearly the same specific gravity as the granite, that ordinary wet methods of concentration would not be applicable. In this respect the deposit is unique.

The company which is exploiting the property has been actively engaged in churn-drill operation, underground and dump sampling since May, 1912. Six Star traction drills, No. 23, have been in use, operated by American crews. On account of local conditions, daily footage has been considerably lower than would be considered average work in the United States. Difficulty was encountered, due to unusually frequent breakage of tools and in many cases holes were lost before they had passed through the ore on account of the lack of suitable fishing tools. Roughly, the drills were in operation only 60% of the time, due to the above and various other causes of delay. In several holes trouble was experienced, due to the corrosive action of the $CuSO_4$ on the drilling tools. In one case a bit was entirely destroyed in a brief time, as shown in a picture accompanying this article.

Rhodesian Mining Notes

Johannesburg Correspondence

Owing to the dry season, Rhodesia is suffering from shortage of water and unless rain comes soon, the results will be disastrous. Already several properties have ceased work and others will shortly follow, owing to there being too few oxen to draw supplies of fuel. "Mealies" have risen from 12s. to 24s. per bag, and many settlers are threatened with ruin. The chief mines continue to develop well.

The Connemara mine has 170,000 tons of oxidized ore developed, of an estimated gross value of £275,000. Developments in the sulphide zone at a depth of 250 ft. are reported to be good. From assays of oxidized ore in the Empress-Palmeria mine in the Selukwe district, it appears that there are extensive bodies of commercial ore. The sulphide ore at a depth of 200 ft. has been found to be of profitable grade wherever exposed.

Promising Discoveries Made in Makaka

Promising discoveries are reported from Makaka, the northeastern portion of Rhodesia, near the Portuguese boundary, and these have been taken over on option. The reef has been cut at the sixth level of the Cam & Motor mine, showing ore of average grade. The mine was inspected by a consulting engineer from the Rand, who is reported to have confirmed the estimates of ore reserves to be 950,000 tons assaying 10.5 dwt.

On the upper level of the Shamva the orebody is 740x88 ft., assaying 3.8 dwt.; on the first level, 920x110 ft., assaying 4.14 dwt.; maximum width, 215 ft. On the second level it measures 820x97 ft., assaying 6.77 dwt., and on the third level, 800x27 ft. The developed ore reserves, Sept. 30, were 2,203,912 tons, valued at $2,323,513. The ore extends below the third level.

The Bell Reef is an example of a tributing proposition that has not so far proved a bargain for the company taking it over. The owner was paid £30,000 for his rights and plant, and about £20,000 has been spent in development, while £50,000 is required for further work and a plant to treat the refractory ore. To the fifth level to date there is developed 42,500 tons of 12-dwt. ore. The Grant mine is reducing the grade of ore mined. Prospecting by drill has been attended by some encouragement, but so far the faulted orebody has not been recovered. The Globe & Phœnix mine has been hampered by water shortage, but better results are being obtained from the 19th or bottom level.

The pegmatite tin deposits have so far proved disappointing, but a rich discovery is reported from the neighborhood of Chishawasha near Salisbury. The lode has been cut in the sixth level of the Falcon mine. The ore is worth £4 2s. 6d., in gold and copper, over a width of 39 ft. The ore reserves are stated to be 730,000 tons, having a value, with the present price of copper, of £2,100,000. About one-third of this is gold. Probably but 66% of the gross assay can be recovered.

❋

The Anglo-Persian Oil Refinery, at Abadan, Persian Arabistan, has started operations, says Consul Emil Sauer, Bagdad ("Daily Consular and Trade Reports," Dec. 12, 1912). Abadan is 44 miles below Bassorah, on the Persian side of the Shat-el-Arab. Oil was discovered several years ago above Awaz, about 140 miles inland from Abadan, and wells were sunk, and a pipeline laid to Abadan. The present daily capacity of the refinery is said to be 24,000 gallons.

A Microscopist in the Field

By Walter E. Koch*

SYNOPSIS—The author uses a simple form of microscope, which enables him to study a rock or mineral in place. Thin sections of metallic minerals are not essential, good results being obtained by grinding samples in an agate mortar, horning and using the skimmings and concentrate for microscopic examination. The value of microscopic study, in conjunction with chemical analysis, in finding the reasons for losses in concentrating and cyaniding is emphasized.

❖

At Freiberg many years ago I had the privilege of attending the lectures of Prof. B. von Cotta, and through his kindness, I became a private pupil of Prof. Theodore Richter, who taught me the use of the blowpipe, spectroscope and high-powered microscope in mineralogy and petrology. While there I conceived the idea of constructing a simple form of microscope for using powers of from 30 to 120 diameters with polariscope in the field. I have carried this microscope over most of Europe, much of the United States, Mexico and Australasia.

I can place it on a rock surface and observe minerals in rifts and cavities, and also in chips and slivers. I then crush samples in an agate mortar to impalpability, and horn them, saving the float by skimming with filter paper, and concentrating the heavier particles. The skimmings supply me with material for the polariscope. Thus one can study rocks and minerals on the spot; or at the mouth of the shaft or tunnel, and in a short time obtain a good knowledge of a vein and its adjacent rocks; while if material is required for further examination, it can be obtained at once. Obviously this method is better than laboratory work at a distance. Although thin sections on slides are absolutely needed for the accurate determination of many rock minerals, yet I have not found them especially useful for metallic minerals.

Important Metallic Minerals Chiefly Isometric

Here are some of the results of many years' study with my microscope, coupled, of course, with experiments and chemical investigation. The most widely distributed of the important metals is gold, which appears in the most unexpected places, under high microscopic power; then come silver and copper. They crystallize in the isometric or cubic system. The most widely distributed of the important metallic minerals are pyrite, magnetite, hematite, chalcopyrite, galena, sphalerite, and argentite. Five out of the seven mentioned are isometric or cubic; chalcopyrite is tetragonal, and hematite hexagonal-rhombohedral; none of them is biaxial.

I have found all these native metals and metallic minerals in igneous rocks generally, not merely in those immediately connected with fissure veins, ore deposits, and mineralized areas; although, of course, they are more abundant in mineralized districts, and as one approaches areas of mineral deposition.

These seven metallic minerals are often in unstable forms, for twinning and striation show "indecision" (if I may use the term) at the time of crystallization, and give rise to lines of weakness along which liquids or gases can easily penetrate; that they have done so, the microscope abundantly shows. It is fortunate that it is so, as from these seven we derive most of our wealth. It is also interesting to note that iron crystallizes in the isometric system, but is so extremely unstable that we rarely find it native in a crystalline form. I omit cassiterite which is tetragonal, twinned and striated, as that has a peculiar history of its own.

Thus we see that gold, silver, copper, and I may add iron, are cubic or isometric, together with pyrite, magnetite, galena, sphalerite and argentite. A good deal of so called low-grade chalcopyrite, I find to be pyrite, as pyrite may contain 5% of copper without a change of form, but with a change of color. I have included magnetite, as from its wide distribution in rocks, it must have played an important part in mineralization.

Under High-power Microscope No Rock Solid

I have noticed in studying orebodies, veins and the adjacent rocks, under high powers, that as one recedes laterally and goes deeper the cavities become smaller. These cavities are extremely interesting, as many of them are formed by the removal of the above named metallic minerals, which have often left their crystalline forms impressed on the other minerals and therefore can be identified. These and other cavities are frequently filled with secondary minerals, giving the rock a solid appearance. At a varying distance from the vein or orebody, the adjacent rocks will be sure to contain some of the previously mentioned metals or metallic minerals. I may say *en passant* that I have never seen a "solid" rock, if the microscopic power was high enough; all rocks seem to me to be merely filters of different degrees of fineness, which get coarser as one approaches areas of ore deposits, and veins; which after all, are, or have been drains or catchments.

This is particularly well seen in districts where limestone has formed, or still forms, the higher ground, so that the surface waters *en route* to the drains and catchments are or were obviously endued with great solvent powers. My travels and observations have led me to believe that surface waters alone could easily have formed, during long periods of geological time, all the gold, silver, copper, lead, zinc and iron mines I have seen; by going down cold, and coming up hot. It seems to me that the metallurgy of the future will consist more and more in extraction by solvents and precipitation by electrolysis or in other ways. Take the compound, SnO_2, as precipitated in the laboratory, it is insoluble in solutions which will dissolve it as cassiterite.

Isometric Minerals Predominate at Depth

I have also observed that in fissure veins, in depth, the isometric metals and metallic minerals above mentioned, become more and more predominant. In samples from the bottom of some of the deepest gold, silver, copper, lead and zinc mines, I have found small cavities with isometric forms of gold, silver, copper, pyrite, galena, argentite and sphalerite. At the bottom of the deepest

*Mining engineer, El Paso, Texas.

mines in Mexico, I found small cavities with silver, argentite and pyrite. From the deepest mines in Bohemia (nearly 4000 ft.) I found argentiferous galena and pyrite, in small cavities. The deepest mines and the last hoistings on many old dumps often show the same thing. Pyrite seems to be the last in depth, and an increase in pyrite, as the predominating metallic mineral, is not generally speaking a good sign, and requires close watching, especially if cavities are diminishing as well.

As far as my observations go, I have found marcasite and chalcocite to be secondary and this appears to be true of the rhombic and oblique metallic minerals generally. Take a fissure vein of copper minerals in Arizona for example; near the surface is a great mixture of crystalline forms and combinations, which become simpler as we descend until chalcopyrite and pyrite are predominant, but small cavities and pyrite will be at the bottom. In the gold mines of Victoria I have noticed small cavities and pyrite at the bottom of the deepest shafts.

Microscope Should Find Wider Use

It appears to me that a knowledge of how to use the high-powered microscope would be most useful to mining engineers, chemists, assayers, and superintendents. I have often seen plans of mines, whereon assays were marked every fifth foot of workings, but how much better to have marked the minerals also, not by guess or hand glass, but determined in a scientific manner. From the same pulp given to the chemist or assayer, a trained microscopist could horn a sample, and long before the assay or analysis was finished, he would have the gangue and minerals worked out and could give valuable information to the concentrating or cyanide mill; for only by the high-powered microscope can the physical condition and chemical combination be quickly determined.

Even if the ore is massive and confused, treatment with acid or alkali will usually show a crystalline form that can be recognized. Injurious minerals can be thus determined. In the cyaniding of gold the microscope shows why sliming and aëration help things along. The gold is often locked up in exceedingly small crystals of pyrite. I have often found the gold in pyrite lying in thin films on pitted or eroded inner surfaces, showing the gold penetrated the crystal after it was formed; but when the inner surfaces or planes are bright and not pitted, this means simultaneous deposition. Moist oxygen and sliming are needed to free this gold. In galena and chalcopyrite I have noticed the same condition of gold and silver. Gold frequently occurs in quartz, as films on the inner planes, and in the tailings from the finest slimes I have seen the gold still inclosed in the minute quartz crystals, which proves we cannot get it all out.

Microscope Helps Solve Cyanide Problems

I once had a curious case in pre-tube-mill times. The rock was a black andesite intrusive, and carried nearly an ounce of gold, but did not leach well. I ground it extremely fine and horned it down to a black residue of fusiform and pear-shaped nonmagnetic particles, which by assay showed abundant gold, while under the microscope one could see the gold in the particles like gold leaf. The chemical analysis gave silica, iron, alumina, lime and soda; in fact it looked just like a slag. After we knew how it occurred it was not hard to extract the gold. It seems to me that if one studied the problem scientifically with the microscope and chemistry combined, there would be no need to ship concentrates from gold ores to the smelter.

Some time ago, in Mexico, I was working a gold mine, where there was also a little copper; suddenly, about 300 ft. from the surface, a hot spring burst forth in the vein, having a temperature of 90° C. I at once collected a large quantity of it in carefully cleaned glass bottles, filtered it, and evaporated down to dryness in a 10-liter porcelain dish. It gave off carbonic-acid gas, and was perfectly clear after filtering. I got a large quantity of carbonates with some sulphates of lime, soda, and magnesia, with a trace of potash, but only a faint trace of any chloride. I dissolved the precipitate carefully, and finally got a small residue, which under 200 diameters gave three tiny specks of gold, and a few specks of pyrites, which on chemical examination gave iron and copper. The water gradually cooled off to about 10° C. but in the colder period I never could find any more gold, or mineral matter save iron, and in a short time it dried up.

After finding the gold I hunted further for chlorides but never could get more than a trace, although I occasionally found a speck of gold, as long as the water was warm; about 50° C. I feel sure the gold was not extraneous, as I took every possible precaution, so it seems to me that the gold must have been dissolved in these hot alkaline waters, for they were always slightly alkaline to litmus. This appears to show that gold is more likely to be carried up by hot water than down by cold, and it also shows how useful a high-powered microscope is, for by putting all the gold residues together and carefully assaying them we could only get a faint trace of gold. This is only one example out of many others of similar observations.

In the cyaniding of silver ores it seems to me of the utmost importance to find out the modes of occurrence, as silver is found in so many minerals and chemical combinations; here then more than anywhere else the high-powered microscope should be extremely useful. A careful and constant examination of the tailings would show just where the losses occurred and the reason, and chemistry must confirm the result, for they must be worked together to insure profitable results. I have always done so and find it absolutely necessary, as Professor Richter impressed it on me years ago. Again the cyaniding of silver concentrates needs all the scientific methods that can be brought to bear on it, and the microscope is a powerful aid.

Form of Crystals Important in Concentration

In the crushing and concentration of metallic minerals I have found it of great assistance. Obviously what we want to avoid is the formation of flat particles, "floaters". Gold, silver, copper, galena and argentite are sectile and therefore make floating forms, but they are also isometric, as also are pyrite and sphalerite. Cassiterite, specific gravity 6.8, and chalcopyrite, specific gravity 4, belong to the tetragonal system, and both are good floaters. Cinnabar, specific gravity 8, and vanadinite, specific gravity 7, belong to the hexagonal-rhombohedral system and

supply floaters. So we see specific gravity does not help us much in such cases.

The microscope shows us that the minerals belonging to these three systems crush in flat forms, just because of their crystalline habit. Under a high power these floaters show the same characteristics, namely rough surfaces, with here and there a bright surface or true cleavage plane, or weak place that has started the fractures. The more such forms are crushed the more floaters result, because they continue to flake off like mica along the same lines.

I have observed this feature in all the minerals above mentioned, and in others belonging to the same three crystallographic systems. The metallic minerals belonging to the other three crystallographic systems do not appear to behave in this way. Now this seems to me to be a strong argument in favor of crushing in stages, with removal of the mineral at each stage, for it is evident that the sooner the mineral is removed from the rolls the better, unless one wants floaters. Observations with the microscope have shown me that rolls are generally to be preferred to stamps, at all events for concentration.

In the case of cassiterite I should think that stage crushing and separation, with a final dry crushing in a Hardinge conical mill followed by dry tables might be tried. I made some experiments along this line and they seemed to promise good results. In smelting I have also found the high-powered microscope useful in examining flue dust, and so helping to regulate the working of the furnace.

These are merely personal observations extending over many years, but they lead me to believe that it is worth while to study crystalline structure in connection with concentration and cyaniding.

One question suggested itself to me long ago, but I am not quite sure of the answer yet, and there must be an answer to it, namely; why is it that the most widely distributed and most persistent in depth of the metals and the metallic minerals (mostly simple sulphides) crystallize in the isomorphic or cubic system? Is it a case of evolution from the cube as the primitive form? There are other questions, but they are too academic for this article.

The Occluded Gases in Steel

Under the title, "The Gases Evolved on Heating Steel to its Melting Point in a Vacuum," G. Wesley Austin described some experiments he had made on this subject, at the Iron and Steel Institute's September meeting.

GASES EVOLVED FROM IRON AND STEEL.

Material	Analysis C	Si	Mn	S	P	Gas Analysis CO_2	CO	H,N	Quantity c.c. per gram
Cast Down.....	3.50	2.50	0.60	0.05	1.50	3.1	23.0	73.9	0.24
Crucible Steel.....	1.10	0.24	0.39	0.02	0.02	0.04	44.2	55.4	1.73
Medium Steel.....	0.49	0.35	0.72	0.02	0.02	0.60	45.1	54.3	1.35
Openhearth mild..	0.09	0.05	0.75	0.05	0.05	a5.6	31.5	62.9	0.66
						b0.07	43.0	46.3	0.31
Bessemer mild....	0.05	0.09	0.29	0.02	0.05	a5.2	59.8	35.0	0.87
						b3.8	43.5	52.7	

There are no separate analyses for hydrogen and nitrogen given, except in one mild openhearth steel, in which the first gas evolved was: CO_2, 7.7%; CO, 18.4; H, 59.1; N, 14.8. In cast iron and crucible steel the first and the last portions of gas did not apparently differ greatly in composition, but in mild openhearth steel, the first gas to come off was probably richer in hydrogen.

Oldest Lead Mining in the United States

By Charles R. Keyes*

In the history of the American lead industry, 1650 is a notable year, as it was about this time that mining of the metal was begun almost simultaneously and independently in three most widely separated points of our present national domains, at Middletown, Conn.; near Oro Blanco, in southern Arizona, and in the vicinity of Dubuque, Iowa. An earlier mention of lead being made into bullets at Falling Creek, Va., appears to refer to the utilization of some small masses of float-mineral.

The Dubuque lead region has claim to development even earlier than the date mentioned, and to the first recorded systematic mining in the country. Champlain's far-sighted policy of securing to France the heart of the American continent by conciliating the Indians early led to the pushing out of friar and fur trader to the westernmost shores of the Great Lakes. A few years later (1634) the intrepid Jean Nicollet was already within sight of the Mississippi River, not far from the point where the present city of Dubuque now stands.

Fur Trading Created Demand for Lead

Nicollet was the first white person to introduce firearms among the natives of the region. This fact had an important influence upon the opening of lead mines. In order to encourage the hunting of fur-bearing animals his immediate successors widely distributed guns and ammunition; and the demand for the latter soon grew strong. As the traders gathered in the furs they also kept a sharp lookout for lead to mold into bullets. Their Indian allies were not long in directing them to the lead district.

During the two decades immediately following Nicollet's visit the fur trade of the region was greatly stimulated. The evidence appears ample to sustain the contention that by the Indian fur hunters, and doubtless by many of the early French *voyageurs* and *coureurs des bois,* who left no written record of their work, lead ore was mined and smelted in crude fashion in this district even before the year 1650. At any rate, when Radisson and Grosseilliers, in 1655, entered the region and visited the Mascoutens (Muscatines) and other tribes in the vicinity of the present city of Dubuque, they found that "In their country are mines of copper, of pewter and of ledd." This was more than a quarter of a century before the reported discovery of lead in neighboring Wisconsin by Nicolas Perrott.

The lead of Dubuque appears to have a history going back perhaps to prehistoric times. The mineral galena occurring in bright, sparkling masses seems to have been known to the aborigines of the Mississippi valley long before the advent of white man in the region. It was found in some of the tumuli of the so called mound-builders. It was brought in by the Indians to some of the first French posts established in the region. In the first half of the last century the Sioux Indians of Minnesota were accustomed to inlay their catlinite pipes with metallic lead in geometric designs. This was probably not a recently acquired accomplishment, but an art that had its origin in the long ago.

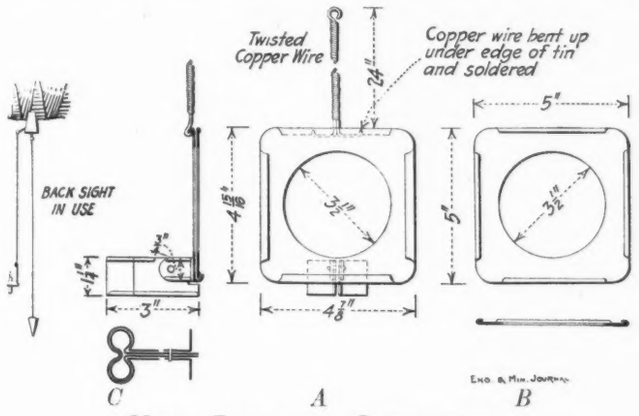
*Consulting engineer, Des Moines, Iowa.

DETAILS OF PRACTICAL MINING

Miami Backsight Illuminator

By Foster S. Naething*

At the mine of the Miami Copper Co., Miami, Ariz., a transit party underground has consisted of an instrument man and assistant. In order to do as rapid work as possible one of the assistants, Francisco Ramirirs, originated and made the backsight illuminator described. The illuminators have been used for two years and have proved satisfactory and easy to use. The plumb bob is hung from a spad in the usual way, the helper then puts another spad a slight distance in the plug, as shown in the sketch, using only a small amount of pressure, so that the spad can easily be removed and also to avoid any chance of moving or splitting the plug. As the backsight illuminator is light this second spad will easily hold it up. The spads used are made by hammering



Miami Back sight Illuminator

out No. 6 burro-shoe nails and cutting a slot in one side with a hacksaw.

If the station used as a backsight is in the timbers, of course the spad can be pressed in a little further with no chance of any damage. Any station used many times as a backsight has a nail put in permanently on which to hang the illuminator. By simply bending the copper wire and hooking over the slot in the spad, the illuminator can be hung at any height. The part designated in the sketch as *C* was made hinged, so that by folding *C* parallel to *A* and folding the copper wire the whole thing can be carried conveniently in an ordinary pocket. All the parts are made of tin except the twisted wire. Part *A* is made with the edges bent over forming a groove, so that part *B* can be slipped in after a piece of tracing cloth or heavy waxed paper has been placed in *A*. Part *B* stretches the cloth smoothly over the opening and, being removable, allows a soiled piece to be quickly replaced. Part *B* has the edges bent back and pounded down, giving it a little more strength. Both *A* and *B* have the corners rounded to prevent catching in the pocket or scratching the user. Part *C* is soldered on the back of *A*. By using an illuminator for the backsight, the assistant can hang it up while the transit man is setting up, and then go to the foresight. The transit man can double the angle without waiting for his assistant to walk back to the backsight. The pressing of a spad into the backsight plug sounds like a dangerous proceeding, but a plug has never been moved or injured by so doing.

*Mining engineer, Miami, Ariz.

❖

Concrete Lining of the Kingdon Shaft*

The reinforced-concrete lining of the two-compartment Kingdon shaft at the United Globe mine of the Old Dominion Co., at Globe, Ariz., was completed on Aug. 28, 1912, the lining extending from the collar to the bottom of the shaft, a distance of 1017 ft. In October, 1911, the timbering of this shaft was destroyed by fire, and it was decided to put in a concrete lining. The contract was let to Paul Michaelson and C. H. Weideman, construction engineers, and preliminary work was started in January, 1912. It was decided to build the lining by lifts or sections, beginning near the top and working downward, and the work was finally accomplished in six sections, from 150 to 220 ft. in height, depending on the condition of the ground.

About a month was spent in the preliminary work of erecting a temporary headframe, crushing plant, concrete mixer, etc., and in cleaning down the charred timbers and loose rock from the first section, extending from the collar to a point 160 ft. below. Two specially built, heavy, wooden cages swinging freely in the shaft were used throughout the work.

In lining a section, the walls were stripped of charred timber and loose rock, beginning at the top and working downward, and light temporary sets of timber put in, with a few lagging pieces wherever necessary, so that the men were always protected from falling ground.

When the bottom of the section was reached, temporary timber bearers were placed along the sides and ends and across the center of the shaft, forms were built upon them, and a permanent reinforced concrete bearer, four or five feet high was put in. Two or three days were allowed for this to set after which the concrete lining was built up on top of it. The forms were built in sections 12 ft. high, and the concrete poured in between the form and the rock walls of the shaft. As soon as one 12-ft. section was filled, another was erected on top of it, plumbed and blocked, and filled with concrete in the same manner. The work proceeded thus until the bottom of the finished lining above was reached, the temporary timbering being removed as fast as the forms were erected.

The concrete was made to run from the conical mixer into a hopper and down the shaft through a 4-in. iron pipe to the point where it was needed, where it was caught in

*Data regarding the concreting of the Kingdon shaft were received simultaneously from Charles B. Eades, of Miami, Ariz., and F. E. Calkins, of Globe, Ariz. This article is compiled from information given by both.

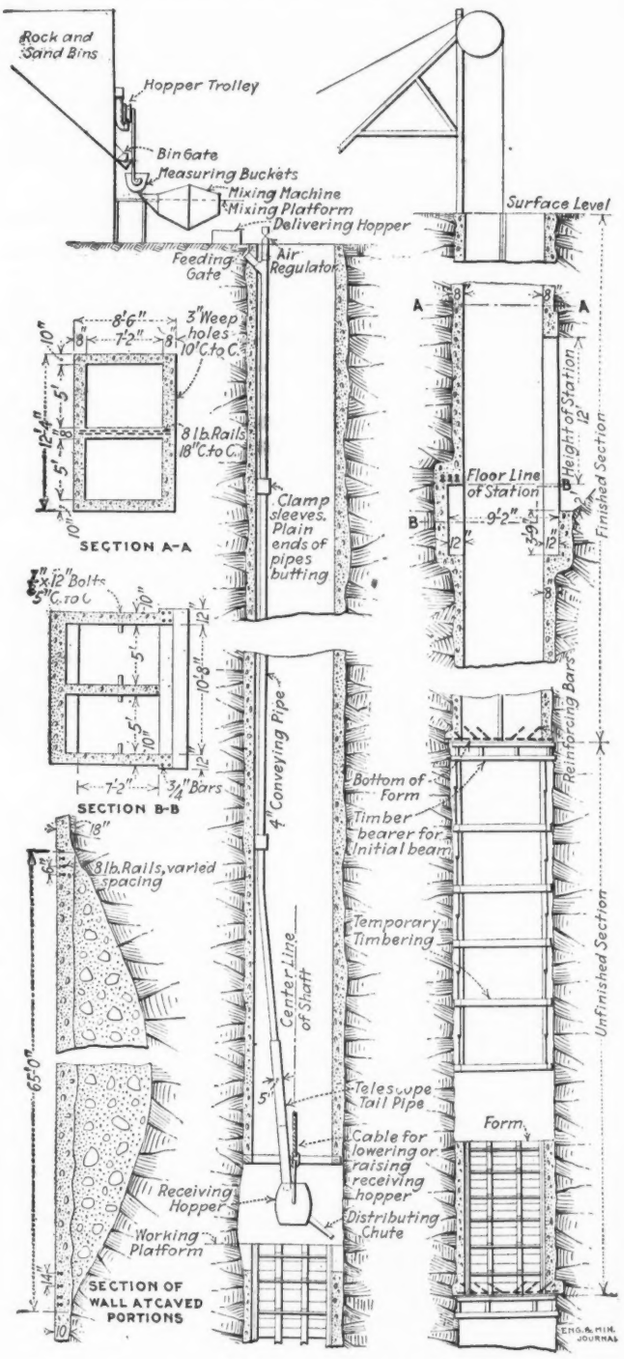
an ordinary steel sinking-bucket, suspended from the finished portion of the lining above, and allowed to run through a hole cut in the side of the bucket a few inches above the bottom, and through a short steel chute into the forms. This was an efficient and flexible arrangement as the bucket could be easily swung or turned, and a continuous stream of concrete directed to any part of the forms desired. The concrete was successfully dropped in this manner for a distance of over 1000 ft. in building the last section. The velocity of the concrete was but little greater through the pipe to the deepest part of the shaft than to the sections near the surface, provided the mixture was fed regularly and the upper end of the pipe closed at the end of each batch. This was easily done by placing a piece of canvas over the opening, stopping the air current in the pipe thus checking the velocity of the concrete, and tending to break it up into smaller pieces, which fell with less force.

Forms used were of 2-in. lumber dressed to uniform thickness. They were set up by placing 4x4-in. posts in the corners of each compartment, with one 4x6-in. post between corners on the 5-ft. side and two on the 7-ft. side. A set of 2x6-in. braces was placed between these posts at every three feet of elevation. In placing the forms two sets of false timbering were removed, giving room for a set of form posts 12 ft. long. These were put in, plumbed and braced and the 2-in. plank nailed to them a foot or so in advance of the concrete as it was filled in. When the form was full, two more sets of timbering were removed and another set of form posts put in place, so repeating the operation until the entire section was completed. Forms were left in place in each section until the entire section was completed, then taken out, beginning at the top, and cleaned for use in the next section.

The specifications called for forms behind the concrete and back filling behind these forms for all cavities of too great size to be filled with concrete, but as the work proceeded the contractors realized it would be cheaper and more efficient to build rubble walls instead of back forms, filling in all back space with broken rock and boulders of sizes easily handled. When this rubble work was used the thickness of concrete walls was increased to as much as 18 in. in some instances and reinforced. The thickness of the wall and quantity of reinforcement depending upon the vertical height of back filling, which in one instance was about 65 feet.

The mixture to be poured between the rubble walls and the form was mixed dry enough that no water would appear upon the surface after being well worked in a plastic mass that would run slowly down a slope of 20°. This drier mixture went through the pipe as readily as if wetter. Had the thinner mixture been used the water would have separated from the sand and rock, taking the cement with it and leaving a lean concrete behind.

The long walls of the lining were given a minimum thickness of 10 in. and the short walls and center wall eight inches. Where the rock walls were very irregular, forming large concavities, large rocks brought down on the cages were thrown into the concrete. The center wall was reinforced every 18 in. vertically with mine rails laid across the shaft in the center of the wall. The end and side walls were thus reinforced only at points where the ground was bad and at stations. Bolts were imbedded in the concrete at regular intervals for fastening the guides. Old water pipes were cut into short lengths and placed in the concrete for weep holes through the walls. A set of four of these was placed every five feet. The best time for placing these pipes is at the end of a run of concrete, when they may be placed and pushed down until covered with concrete without being filled.



CONCRETING THE KINGDON SHAFT AT GLOBE, ARIZ.

The concrete was a 1:3:6 mixture of portland cement, quartz sand, and crushed limestone from ¼-in. to 1-in. mesh. About 2300 cu.yd. of concrete and 750 cu.yd. of large rock were used.

About 25 men were employed on the job, working two shifts. The total time consumed was eight months, of which the first month was spent in rigging up the surface plant, etc., and most of the rest of the time in clean-

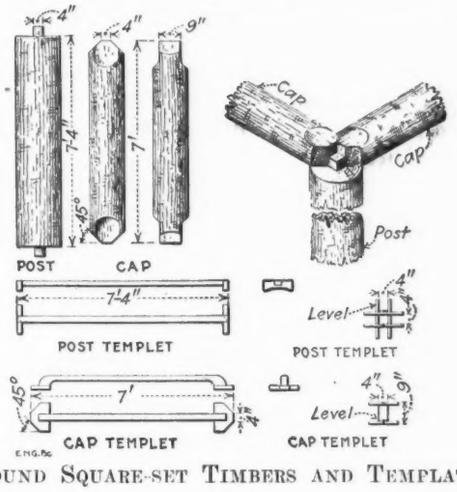
ing down the walls and putting in temporary timbering preparatory to concreting. Also the lower 110 ft. of the shaft consisted of a raise driven to one-compartment size and this had to be enlarged to full size. The actual work of concreting was done in 100 days, or about 40% of the total time consumed. Ordinarily, one 12-ft. section of concrete per day was put in, but in bad ground a 6-ft. form would be used. The maximum day's work was 22 ft. The two compartments are 5x7 ft. 2 in. inside the finished lining. The shaft will be used only for ventilation and for hoisting and lowering men working in the east end of the mine.

It is most interesting to note that the area of the compartments is over 60% greater than the area of the old, timbered compartments, which were 4x5 ft. 6 in., showing that with a given area of ground broken a much larger shaft area may be obtained with a concrete than with a timber lining. The contractors received $30,000 for their work, or $28 per foot.

Square Set Timbers

By L. D. Davenport*

The framing of square-set timber in the Chisholm district, Minnesota, is done by contract. Sixteen-foot round



Round Square-set Timbers and Templates

timbers, about 12 to 14 in. in diameter, are used for posts. These 16-ft. pieces are cut in two and framed on one end for bottom posts and on both ends for top posts. The tenons are 4 in. square and 4 in. long, thus making the bottom posts 7 ft. 8 in. from end to shoulder and the top posts 7 ft. 4 in. between shoulders.

The caps are cut from 14-ft. round timber, about 10 to 12 in. in diameter. The ends are flattened to 9 in. in thickness to make a bearing for the shoulders of the posts. A 4x9-in. face is left on each end of the cap to fit against the tenons of the posts and the remander of the end is cut off at 45°. The caps are 9 in. thick and the length of the corresponding tenons on the posts is 4 in. for each post, which leaves 1 in. between the ends of the tenons when the timber is first put in place. This 1-in. space is left to allow the caps to crush down slightly before the tenons bear on one another. This cushioning effect of the caps prevents the post from splitting when the room takes weight.

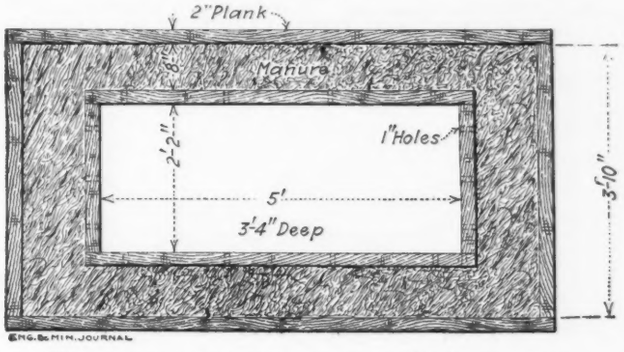
As may be inferred from this style of framing, the most of the weight in the stopes is from the top. The accompanying sketch shows the templates which with an ax, adze and crosscut saw, constitute the outfit of the timber framer.

*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

A Fireless Powder Thawing Box

A satisfactory arrangement, utilizing the heating power of fresh horse manure for thawing frozen dynamite, is in use underground at Mineville, N. Y., by Witherbee, Sherman & Co., Inc. The thawer, as shown in the accompanying drawing, has a capacity of eighteen 50-lb. cases, and is nothing more than a double box built of 2-in. planks with an 8-in. space between the outer and inner boxes, which is filled with manure. A double lid, filled with manure, is used and the bottom of the inner box is also filled with manure, so that the powder is surrounded on all sides, top and bottom by the heating material. One-inch holes are bored through the inner box into the manure-filled spaces to permit circulation of the heated air.

The powder may be put into the thawer while in its original boxes or the sticks may be put in loosely, which enables it to thaw a little more quickly. Where loose sticks are placed in the thawer and different strengths of powder are used, it will be found convenient to make vertical partitions in the inner box, so that the different grades will not become mixed. It has been found that when the manure is fresh, the temperature of the inner box may become as high as 110° F. This arrangement does away with all the dangers and inconveniences of any other type of thawer and has been found satisfactory.



Horizontal Section through Thawing Box

Deceptive Diamond Drill Hole

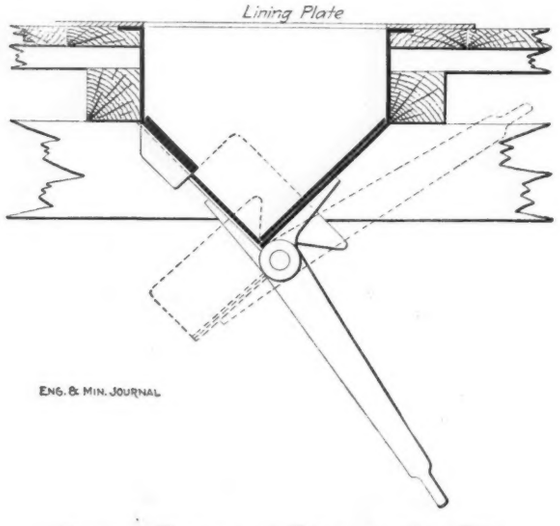
In drilling an iron property, one hole showed 18 ft. of ore at a depth of 55 ft. A two-compartment shaft put down on the hole penetrated 35 ft. of surface material and 40 ft. of taconite. Only a small seam of ore was encountered, which the drill had evidently followed. In view of the failure of this shaft to confirm the showing of the hole, a contemplated enlargement of plant was abandoned and the original prospecting plant continued in service for driving laterally and examining the ground tested by the other diamond-drill holes.

The Annual Exhibition of Motor Trucks in New York and Chicago during the weeks of Jan. 20-25, and Feb. 10-15, respectively, will be of interest to many mining men, in view of the increasing use of motor trucks for mine transportation.

DETAILS OF METALLURGICAL PRACTICE

Discharge Door for Flat Bottom Bin

The accompanying illustration shows the type of discharge door used on the flat-bottom bins in the rock houses and mills on the Rand, and which is described in "A Text Book of Rand Metallurgical Practice, Vol. II." The door is designed not only to control the discharge, but is so made with side pieces that the ore is guided in a narrow stream, so as to fall directly into the car beneath the opening without any possibility of spilling by lateral spreading out of the stream. The shape of the side pieces is such that there is no opportunity for pieces of ore to fall away from the door at any position of the



BOTTOM DISCHARGE DOOR FOR ORE BIN

chute-like door between the positions of fully open and tightly closed. The construction of the gate is clearly shown in the illustration.

❋

Area of Amalgamation Plates

The paper on "The Metallurgy of the Homestake Ore," by Messrs. Clark and Sharwood, was discussed at the meeting of the Institution of Mining and Metallurgy on Nov. 21, 1912. Alfred James remarked on the rather extraordinary amount of amalgamated-plate surface used at the Homestake, stating that practice elsewhere at present was rather to limit than to increase the area of plates. In South Africa it was found that with finer grinding but one-quarter of the amalgamated surface formerly used was necessary.

Hugh F. Marriott stated that on the Rand in recent years the question of plate design and area had been closely looked into, and for a time shaking tables were adopted on new installations. The results of long tests, however, showed that fixed plates, set at a somewhat steeper angle than formerly, answered the purpose as satisfactorily as any more complicated design and that nearly all the gold could be caught on the first three feet of the plate.

In this connection Walter Broadbridge said that at the Sons of Gwalia many years ago the plates were enlarged from 16 ft. to 22 ft.; although 80% of the amalgam was collected in the first two feet, gold was always obtained on the last 24 inches.

❋

Gas Washers at the Central Furnaces

The gas-cleaning system of the American Steel & Wire Co.'s plant at Cleveland, Ohio, known as the "Central Furnaces," is described in *Power*, Dec. 3, 1912.

The furnace gases are taken off by four bleeders 3 ft. 9 in. in diameter connecting with four downcomers at a point about 18 ft. above the top of the furnace. On each side of the furnace the two downcomers unite in a single one and the two large downcomers connect at opposite sides of a primary dust-catcher 30 ft. in diameter by about 50 ft. high. This and the centrifugal dust-catchers are placed over a track and the collected flue dust is dumped into cars. This dust forms a part of the regular furnace burden.

From the primary dust-catcher the gas passes out at the top through a riser which makes a sharp turn into an 8-ft. main leading to the large centrifugal dust-catcher. Up to this point the gas passages are lined with 9 in. of firebrick as the temperature of the gases leaving the furnace is from 300 to 400° F. There are one 14-ft. and two 12-ft. centrifugal dust-catchers arranged in series. A few furnaces have been equipped with a secondary dust-catcher, but the use of four units is a departure. The gas enters the upper part of these chambers on one side, the gas main forming a tangent to the annular passage. This imparts a whirling motion to the gas, which then passes down through the annular passage and turns sharply upward through the inner shell, out the top and down to the tangential entrance of the next. The dust falls down the sides of the shell into the dust chamber, which is protected by a conical cover from the direct current of gas. This conical cover also serves to direct the gas upward to the outlet of the dust-catcher. At the bottom there is a counterweighted bell valve with an inclosing spout to concentrate the stream of dust. A 2-in. spray pipe in the spout serves both to cool the dust and keep it from being blown away.

After leaving the last 12-ft. dust-catcher the gas passes through a goggle valve. The valve connections at this point consists of four water-seal valves and five goggle valves, permitting either of the two sets of primary and secondary gas washers to be cut out for cleaning or repairs and the flow of gas from both furnaces pass through one set of washers, or one set of washers serve one furnace.

The primary gas washer, Fig. 2, is 20 ft. in diameter by 69 ft. high. The gas enters at the bottom and passes up an annular passage through a number of conical

baffle-plates over which the wash water flows. At the top of the washer the gas turns downward through a central passage leading to the gas outlet. The wash water enters at the top, falling into a small distributing basin from which it flows on to the distributing cone, through an opening around the bottom of the basin and by overflowing its edges. The distributing cone directs the sheet of water to the baffle-plates, over which it flows from baffle to baffle, falling through the ascending stream of gas. The water is then carried off through a trap or gooseneck and flows to a settling basin from which the flue dust can be recovered.

The secondary gas washer, Fig. 3, is the same overall size as the primary washer. The gas enters near the bottom and flows upward through a series of internal and external baffling cones and wire-net diaphragms and passes out at the top. Wash water is fed into the top by 32 inlets which turn horizontally in a trough encircling the top of the washer. The water overflowing the edge of the trough runs down an inverted cone and over a vertical wire-netting diaphragm, through which the gas passes to a cone suspended from the inverted cone, thence over a second netting diaphragm, and so on, until it finally reaches the bottom and passes out through a trap to the settling basin. There are 10 wire-netting diaphragms in this washer, giving a large amount of washing service.

After leaving the secondary washer the gas passes through a 48-in. venturi meter, arranged with a bypass for emergency use. Part of the gas is drawn off, after passing through the meter, for heating the hot-blast stoves, and the remainder passes to a manifold, thence through a water seal and a goggle valve to the baffle washer. The gas enters at the bottom and passes up an annular passage obstructed by internal and external cone baffles with ¼-in. mesh screens in the openings between the baffles. It then passes down through the central gas passage to the outlet of the washer. Wash water enters at the top and falls into a distributing basin similar in construction to that used in the primary gas washer.

From the baffle washer the gas passes to Zschockke washers; these are 10 ft. 6 in. in diameter and 43 ft.

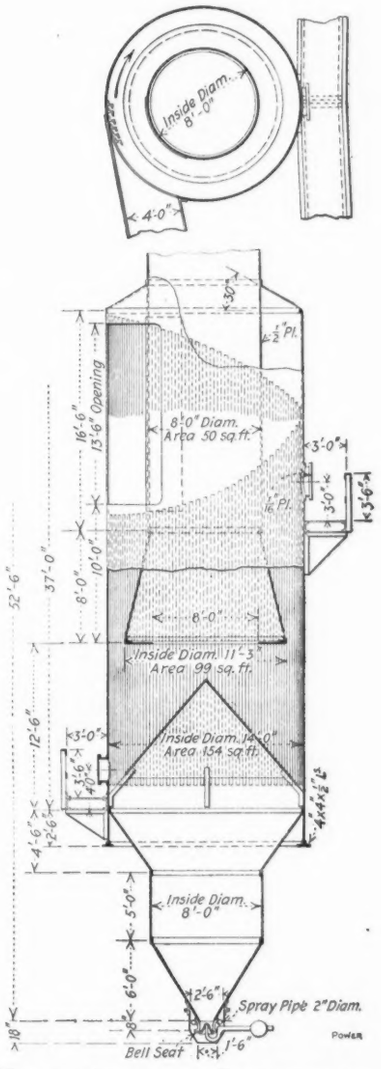


FIG. 1. SECONDARY CENTRIFUGAL DUST CATCHER

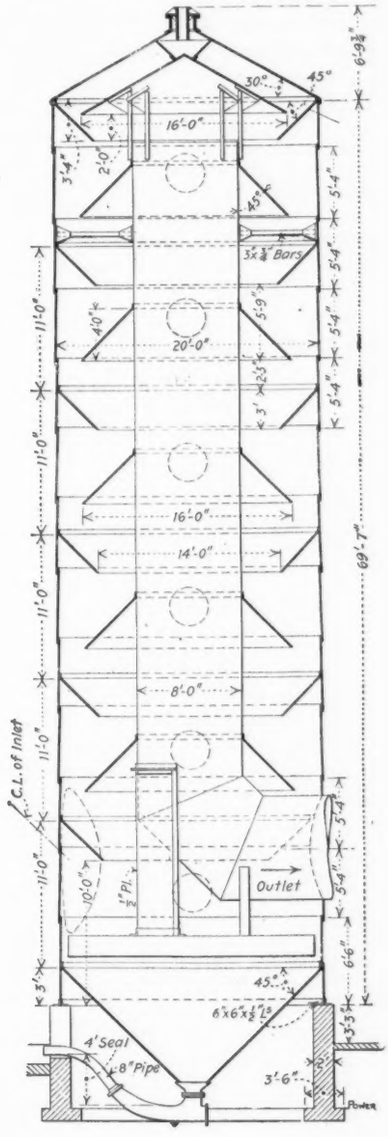


FIG. 2. PRIMARY GAS WASHER

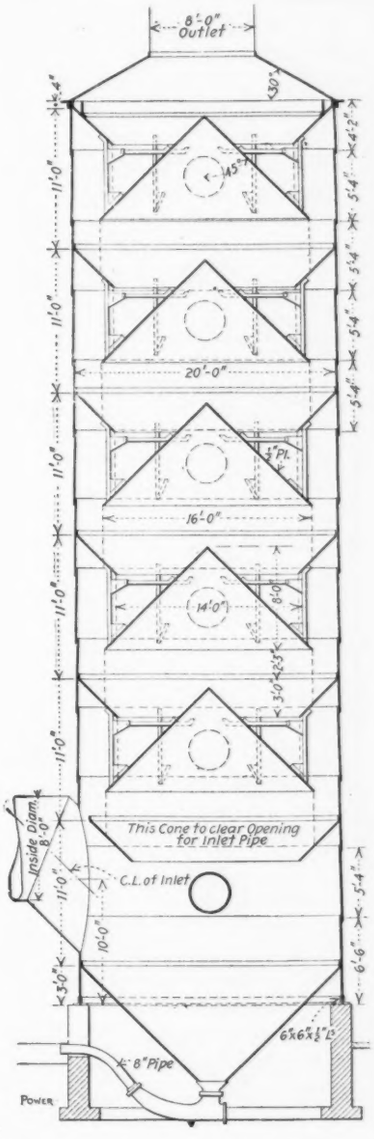


FIG. 3. SECONDARY GAS WASHER

high. The gas enters at the bottom and passes up through a series of 13 wooden grilles, kept wet by the descending water, and leaves the washer near the top. Water enters through 12 distributing nozzles and leaves at the bottom. The wooden grilles can be removed through the clean-out doors.

Gas from the Zschockke washers goes to Theissen washers, which are of the usual construction. These are operated by 150-hp. direct-current motors, but it is the intention to change to alternating-current motors as the constant load characteristics of the Theissen washers is particularly favorable for alternating-current operation. They receive the gas at a pressure of 11 to 16 in. of water and build it up to the holder pressure, at which it flows to the gas engines.

The holder is 55 ft. in diameter with a 14-ft. lift and under normal conditions is kept full. From the holder the gas flows to the gas engines in the alternating-current power house and to the gas-blowing engines.

ANALYSIS OF GAS FOR ONE MONTH.

	CO_2	O_2	CO	H	CH_4	N
Raw gas, per cent	12.7	0.36	26.3	2.7	0.22	57.5
Atmospheric temperature						34°
Barometer						29.66 in.
Grains of moisture per cu.ft. in air						2.41
B.t.u. in engine gas, computed						101.1
B.t.u. in engine gas, by calorimeter						93.8
Flue dust in grains per cubic foot in clean gas washer						1.333
before baffle washer						0.980
after baffle washer						0.361
percentage removed and efficiency						58.45
after Zschockke washer						0.222
percentage removed						13.80
efficiency						31.66
after Theissen washer						0.0185
percentage removed						24.45
efficiency						90.47
in engine gas						0.0185
Moisture in grains per cubic foot in clean gas						26.65
Moisture in grains per cubic foot in engine gas						0.528
Clean gas temperature						162 deg.
Furnace burden, Mesabi ore, per cent						67.53
Furnace burden, flue dust, per cent						4.34

The successful operation of the gas engines in this plant is largely due to the ample gas-cleaning equipment. The table shows the average conditions of the gas for one month, during which period the furnace was working with Mesabi ore and flue dust comprising nearly 72% of the burden. Mesabi ore is extremely fine and frequently gives trouble in the furnace, even when there are no gas engines to be considered. In this case the gas carried 1.333 grains of dust per cubic foot at the entrance to the clean gas washer and 0.0185 grains of dust in the engine gas. The dust in the gas leaving the secondary dust-catchers was so fine that all passed through a 100-mesh sieve and the scum on the waste water from the gas washers passed through a 200-mesh sieve. This scum had the following composition: Coke, 33.33%; silica, 15.02%; iron, 47.33%.

Car Clearances for Shipping Tracks

In the design of screening and other mine equipment abutting railroad tracks, discussion frequently arises as to what clearance is necessary for box and gondola cars, says A. J. Reef, in *Coal Age*, Dec. 28, 1912. The following figures are taken from the Official Railway Equipment Register for October, 1912:

The maximum width of car is at the floor line, or the eaves line. The maximum height is from top of rail to top of brake staff. The necessary additions to these car dimensions to clear men on the cars, or ground, is, of course, still a matter for individual judgment, but is of more importance than is usually recognized. An overhead clearance of 22 ft. above the top of rail, on tracks for box cars, is highly desirable, and should be obtained even at the sacrifice of some convenience. A horizontal side clearance of 7 ft. on each side of the center line of the track is also desirable.

The observance of the above clearances would obviate many accidents to careless cardroppers on mine sidings, and prevent many damage suits being brought against the mining companies.

Following are the maximum actual heights and widths as taken from the register. The particular road to which the cars of maximum dimensions belong is, also, noted in each case.

BOX CARS

Western roads only, maximum height, 15 ft. 2 in., E. P. & S. W.
All roads U. S., maximum height 15 ft. 9 in., Norfolk Southern Ry.
Western roads only, maximum width 10 ft. 11 in., Salt Lake Line.
All roads U. S., maximum width 10 ft. 11½ in., P. R.R.
Automobile, furniture and refrigerator cars not included.

GONDOLAS

Western roads only, maximum height, 11 ft. 1½ in., Gt. Northern.
All roads U. S., maximum height 12 ft. 1 in., Big Four.
Western roads only, maximum width 10 ft. 10 in., C. & S.-E. P. & S. W.
All roads U. S., maximum width 12 ft. 2½ in., P. R.R.

Crushing without Sorting at Knights Deep

The decision to dispense with sorting at the Knights Deep on the Rand revives interest in a subject which has received a great deal of thought and attention, says the *South African Mining Journal*, Nov. 30, 1912. The problem the Knights Deep technical advisers and management had to consider was whether it really pays on a large low-grade mine crushing 100,000 tons or more per month to sort at all. The conclusion reached is that sorting at the Knights Deep is unprofitable.

Sorting at surface never was extensively carried out at the Knights Deep. Underground, large quantities of rock were used for waste packs, but on account of this, and because of the fairly large width of the reefs, there never was much scope for close sorting on surface belts or tables. In the Simmer East, now operated by this company, the main gold carrier is a thin and rich grit, and there is the fear that any extensive rejection of waste rock at surface on ore of this nature might result in the native sorters rejecting the real gold carrier of the property.

While these considerations, of course, weighed in the examination of the sorting problem, the main reason for dispensing with the practice of rejecting waste was the conclusion that, whereas the amount of waste likely to be rejected at the Knights Deep (say, 3000 tons per month) can be crushed for 7d. per ton, or less than £90, the same quantity would cost £300 per month to eliminate on the picking belts. The average value of the Knights Deep sorted waste is about one pennyweight, and the maximum recovery that can be expected from this waste rock is about 0.7 pennyweight. Were the mine a high-grade undertaking, it would not pay to burden the mill with ore of extremely low grade, but at the Knights Deep, with its four pennyweight recovery and large plant, it easily is conceivable that the rejection of waste is an unprofitable operation. In general the practice of sorting must, of course, be considered in relation to conditions prevailing at each individual mine.

NOTES FROM CURRENT LITERATURE

Sensitivity of the Hydroxide Reactions

In a paper read before the Eighth International Congress of Applied Chemistry, L. J. Curtman and A. D. St. John present the results of some attempts to ascertain the sensitiveness of the hydroxide reactions for the common metals (*Journ.* Am. Chem. Soc., December, 1912). These results must be determined by experiment, as attempts to get them by direct calculation of solubility will be negatived by optical factors not influenced by mass action. The results are as shown in the accompanying table. In each case the sensitivity is based on observation of 5.0 c.c. of final solution.

SENSITIVITY OF HYDROXIDE REACTIONS.

Element.	Limit Visible	Condition	Precipitant
Ag	1:40,000	Boiling	NaOH
Al	1:100,000	Boiling	NH_4OH
Bi	1:10,000	Boiling	NH_4OH
Cd	1:40,000	Boiling	NaOH
Co	1:80,000	Boiling	NaOH
Cr	1:170,000	Boiling	.....
Cu	1:10,000	Boiling	NaOH
Fe	1:80,000	Boiling	NH_4OH
Hg(ic)	1:2,000	.....	NaOH
Hg(ic)	1:13,000	.....	NH_4OH
Hg(ous)	1:20,000	.....	NH_4OH
Hg(ous)	1:200,000	.....	NaOH
Mg	1:100,000	Boiling	NaOH
Mn	1:170,000	Boiling	NH_4OH
Ni	1:80,000	.....	NaOH
Pb	1:6,500	Boiling	NH_4OH
Zn	1:80,000	Boiling	NH_4OH

⁂

Reduction of Iron Oxide

According to M. Levin (*Chem. Zentr.*, p. 807, 1912; abstrs. *Journ.* Soc. Chem. Ind., Oct. 15, 1912), the equilibrium concentration of carbon monoxide in the system: FeO, Fe, C, CO, CO_2, is found to increase in a linear manner with rising temperature. This confirms the results of Schenck and others, no evidence being obtainable of the minimum previously observed by Baur and Glässner. The equilibrium concentration of carbon monoxide in the system: Fe_3O_4, FeO, C, CO, CO_2, shows a maximum according to Baur and Glässner at 580° C. These results are confirmed by the present author, although he obtains somewhat higher carbon-monoxide concentrations at lower temperatures. Comparing the two systems it is found that the carbon-monoxide concentration for the system: FeO, Fe, C, CO, CO_2 is much greater at temperatures above 500° C. than that for the system: Fe_3O_4, FeO, C, CO, CO_2.

Therefore to reduce ferrous oxide to iron by a mixture of carbon dioxide and monoxide, the latter must contain a much greater percentage of carbon monoxide than is required to reduce triferric tetroxide to ferrous oxide. Below 500° C., the curves representing the two systems lie much closer together and the reduction of triferric tetroxide to metallic iron may take place almost directly, since a mixture of carbon dioxide and monoxide containing only a little more carbon monoxide than is necessary for the reduction of triferric tetroxide to ferrous oxide will also reduce the latter to metallic iron. The work of Levin and Neidt (*Journ.* Soc. Chem. Ind., 1911, p. 1214) has shown that the concentration of carbon monoxide in blast-furnace gases is much greater than the equilibrium concentration for either of above systems. The author finally compares the carbon-monoxide content of blast-furnace gases at varying temperatures, with that of the system: CO_2, CO, C. Up to 900° C. the concentration of carbon monoxide in the blast-furnace gases is much the greater, as the curves do not approach each other till between 900° and 1000° C.

⁂

The Macquisten Tubes

In a paper read before the Spokane section of the A. I. M. E., May, 1912, O. B. Hofstrand, of Wallace, Idaho, describes the latest development of the Macquisten tubes, especially at the Morning mill, in the Cœur d' Alene. These tubes have already been described in the JOURNAL, and in the main no repetition will here be necessary.

According to Mr. Hofstrand, the tubes are operated most successfully at a speed of 30 r.p.m., and in tubes that are cast with quadruple threads, the feed remains in tubes for a period of 48 sec. before it is finally discharged. The capacity of the tubes is not controlled by the quantity of feed that can be put through, but is entirely dependent on the carrying capacity of the surface of the water and the speed of the surface flow. An average speed of the surface flow is about 10 ft. per min. The quantity of mineral that can be conveyed in a thin film through the tube during a given period varies with the specific gravity of the mineral and the fineness to which the ore is crushed, as the film of mineral which will float off must contain one layer only. The actual amount of zinc concentrate that can be floated during a period of 24 hours is from 175 to 200 lb., containing about 48% zinc. Particles ranging in size from 20-mesh down to inpalpable slime are amenable to flotation. However, in preparing the feed for the tube it must first be deslimed. The reason for this is not that the fine slime cannot be floated, but it is difficult to settle, inasmuch as both mineral and gangue in this finely divided state will float, not only on the surface, but under the surface as well, remaining in suspension in the water. This tends to produce a low-grade and sometimes unmarketable product.

The feed, after being deslimed, is passed through a dilute sulphuric-acid bath, of from 0.05 to 0.5% strength, which cleans the particles and assists in rendering the gangue resistant to flotation. After the feed has reached the tubes, a small quantity of a dilute solution of soap and oil is added for the purpose of increasing the surface flow carrying the mineral particles through the tubes.

The cost of treatment, based on a capacity of 100 tons in 24 hours, is approximately 40c. per ton, using four tubes in series. The cost per ton, based on 200 tons capacity, will not exceed 30c. per ton of ore treated. The cost for sulphuric acid, soap and oil at the Morning mill

is less than 1c. per ton of ore treated. The material treated at the Morning mill is Wilfley-table tailings, the separation being made between (1) the sulphides of zinc and lead and (2) siderite and quartz gangue.

The first installation of the Macquisten tubes was made at Golconda, Nev. The second is at the Morning mill. A third is at Park City, Utah, where the material treated is a Wilfley-table middling, the separation being of zinc and lead sulphides from pyrites, silica and lime.

McKechnie-Beasley Nickel Matte Treatment

Alexander McKechnie and F. G. Beasley have recently obtained U. S. pat. No. 1,047,825 on a process for the extraction of nickel from high-grade or concentrated nickel matte through subjecting it to the action of sulphuric or hydrochloric acid at a temperature of over 100° C. in a closed air-excluding vessel, thereby insuring a corresponding high pressure. Copper is quantitatively precipitated, if dissolved, by the generation of hydrogen sulphide from the various sulphides present, while the exclusion of air provides against its re-solution. The same process may be applied to roasted mattes by adding enough unroasted matte to correct any deficiency in the nickel-sulphide value of the roasted charge. An often more speedy extraction may be obtained by roasting the matte and taking advantage of this latter process.

This patent may be considered as supplementary to, and improving upon, U. S. pat. No. 981,451 of the same authors, describing the treatment of nickel-copper mattes by means of acid or ferrous solutions, with concurrent oxidation by passing atmospheric air through the mixture.

Production of Ductile Tungsten

Detailed descriptions of the process for producing fine tungsten wires is given by O. Ruff (*Zeit. f. angew, Chem.*, p. 1889, 1912; abst. *Jour.* Soc. Chem. Ind., Oct. 15, 1912).

In order that brittle tungsten shall be easily worked into a ductile state, it is necessary that it be entirely free from oxide, from iron and nickel, practically free from nonmetallic impurities such as sulphur, phosphorus, etc., and should not contain more than about 0.1% of carbon. It is desirable that the massive metal should be as dense as possible, i.e., it should be sintered almost to melting point before working, and the actual swaging and drawing should be carried out as gradually as possible, avoiding undue exposure to air.

In order to get a pure metal, it is desirable to purify the initial trioxide, which is done by reducing it to the dioxide, volatilizing the latter as oxychloride, and treating this with hydrochloric acid. In this way silica and phosphoric acid are left behind in the non-volatile residue, while arsenic and antimony pass into solution in the hydrochloric acid. The pure trioxide is reduced in a rapid current of hydrogen at a temperature of 1250° C., so as to produce the metal in a sufficiently coarse state of subdivision and relatively free from oxide. After this has been pressed into rods, the latter are hardened by heating in hydrogen to about 1300° C., and sintered by heating in a special furnace to about 2650° C. In the case of very pure tungsten, it may be necessary to add a little (about 0.05%) carbon to lower the melting point.

It is found that the pure metal melts at about 2900° C., whereas in the presence of carbon the melting point may be as low as 2730° C. There is a diminution in volume, on sintering, of about 14 per cent.

Dangers of Compressed Hydrogen

The explosion of tubes of compressed hydrogen, accidentally contaminated with air, on connecting with a manometer to measure the pressure, has been investigated by Lalarge (*Comptes rend.*, 1912, p. 914; abstr. *Journ.* Soc. Chem. Ind., Dec. 16, 1912, p. 1124): The author has found that if ordinary manometers are employed in the usual way, such explosions may occur whenever the hydrogen contains enough air to render it explosive, and the pressure is sufficiently high. The reason probably lies in the rise of temperature produced by the sudden and more or less adiabatic compression of the air in the manometer. Such accidents may be avoided by interposing, between the tube of compressed gas and the manometer, a safety-tube containing disks of metallic gauze of such mass that they are not appreciably heated by combustion of the gas mixture in the manometer. By this means the ignition of the main body of gas is prevented. Similar safety tubes should be employed whenever a highly compressed explosive gas mixture is allowed to expand suddenly into a confined space. Before measuring the pressure of compressed hydrogen, liable to contain air or oxygen, it is advisable to determine its density, as a further safeguard.

Plasticity of Clay

It was suggested by J. Steward at the International Congress of Applied Chemistry (Orig. Communications, Vol. 15 p. 265,) that the plasticity of clay is due to the presence of an organic aluminum compound, an assumption which is claimed to explain satisfactorily all the established facts concerning the plasticity of clay. It explains, for example, why only impure clays are plastic, why ignition destroys and levigation fails to restore plasticity, the industrial practice of weathering clay before use, and why plasticity is reduced by bases, since the aluminum-organic compound is soluble in alkali. This would also explain why oils purified by filtration over clays should have a sour taste, as some of the aluminum-organic compound would dissolve; why shales lose their plasticity on being metamorphosed to slate would also be explained

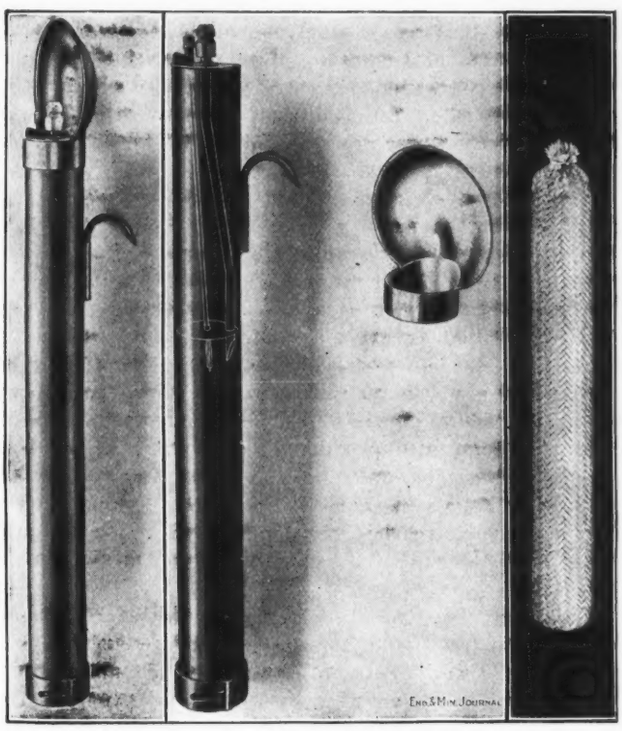
Phosphoric Acid as a Solvent for Alloys

Certain metals or alloys obtained in the electric furnace, which sometimes resist the most energetic chemical action, are attacked and completely dissolved when powdered and heated with an excess of phosphoric acid above 1.75 in density, says *Moniteur Scientifique*, vol. 75, p. 837. This applies to metallic silicon, zirconium, and tungsten, ferrotitanium, vanadium, silico-manganese, titanium nitride, the alloy of ferrosilicon with 23% aluminum, boron-nickel, and carborundum. In all these reactions the carbon contained in the alloys remains, wholly or partially, in a flocculent condition in the sirupy liquid.

Arnold Carbide Candle

Acetylene as an illuminant for use underground, is superseding candles and oil lamps in many mines, owing to the ease with which it may be generated and burned, and to the superior quality of the light. For this reason the carbide lamp or candle recently invented by Ralph R. Arnold, a mining engineer of Cripple Creek, Colo., is of interest. The points of merit claimed for this form of lamp are its simplicity, economy and durability. Trials of this lamp under actual working conditions in some of the Cripple Creek mines during the last two years are said to have demonstrated its advantages over earlier types.

As shown in the accompanying engraving, the lamp is extremely simple. It consists of a tubular body of 22-gage brass, 1¼ in. in diameter by 12 in. long, with a diaphragm in the center dividing it into a water (upper) chamber closed by a revolving shutter at the top, and a carbide (lower) chamber closed by a gasket-lined cap at



Arnold Carbide Candle

the bottom. A water-control valve is placed in the diaphragm and a gas tube extends from the carbide chamber through the diaphragm at the top and terminates in a burner.

The cartridge, containing two ounces of calcium carbide, sufficient to produce a 4-cp. light for four or more hours, is carried in the carbide chamber, the fabric being designed to filter the gas, admit of the expansion of the carbide and contain the consumed carbide, which is quickly removed, thereby eliminating the necessity of cleaning and the use of gas filters.

The entire charge of carbide is consumed, no unconsumed carbide remaining in the cartridge unless the water is shut off before exhausted, in which event it may be retained in the lamp for future use. No time is lost in cleaning lamps, digging out and sifting the residue.

A water valve of improved type with screw adjustment regulates the flow of water and thereby the size of the flame, which may be varied from one-half to eight candlepower at will. Any excess of gas due to too wide opening of the water valve is flashed at the burner and cannot escape into the atmosphere. The height of the water in the upper compartment insures a constant flame, and the total consumption of the carbide without any attention whatever.

The burner produces a fan-shaped flame, eliminating carbonizing and the consequent obstruction of the burner. A nickel-plated removable sliding reflector serves as a wind shield and water deflector, and when slid down on the candle acts as a protector for the burner. William Ainsworth & Sons, Denver, Colo., have been given the sole right to manufacture, and are now marketing the device.

❋

The Talc Industry

The talc industry of the United States enjoyed a prosperous year in 1912 and as usual was not able to supply enough of the finer grades to meet the demand, about 7000 tons of high-grade ground talc having been imported into the United States during the year, chiefly from France and Italy. Prices for the ground domestic talc varied from $5 to $13 per ton, according to quality; for the imported talc, $13 to $25 per ton, averaging probably $18 for the best French and $25 for the Italian.

The fibrous-talc mines in the Gouverneur district of New York, which is the most important talc center in this country, were operated at about normal capacity, producing about 65,000 tons. There was a good demand throughout 1912 for this product, especially in the latter part of the year. Some talc was shipped abroad, mainly for use in German paper mills, though the rise in ocean freight rates checked exportation to some extent. Prices were firm at $8.50@9.50 per ton, some sales being made at as high as $10. The Uniform Fibrous Talc Co. operated its new mill, which differs slightly from the older mills in that a Hardinge conical mill is used in place of Alsing cylinders for the fine grinding. The Ontario Talc Co. operated the Potter mine and its mill, near Fullerville. These mills were operated by the International Pulp Co., which lost two power houses by fires in 1912; the water-power plant and compressor house, on the Oswegatchie River, was burned during the summer, and is being rebuilt in a substantial manner; late in the year, the power house at No. 3 mine was also burned, but the production for the year was not seriously reduced. The Union Talc Co. operated two mills and maintained its normal output. The Freeman mine, at Talcville, shipped some talc during the year to a grinding plant in New Jersey. Ten or 15 miles south, but outside the Gouverneur district, the St. Lawrence Talc & Asbestos Co. has a new mill at its property, about one mile northeast of Natural Bridge. It is in a belt of crystalline limestone and schist, about parallel with St. Lawrence County district. The deposit seems to be of the massive or platly variety, rather than of the fibrous character of the northern belt. Tremolite, however, has been observed in a boulder outcrop near the mine. The talc of the Gouverneur district, according to C. H. Smyth, Jr.,[1] is really a pseudomorph after the tremolite, and it

[1] "The Mining and Quarry Industry of New York, in 1911." Bull., New York State Museum, Albany, N. Y.

is due to this that it possesses a fibrous character. Microscopic examinations of specimens usually show a little residual tremolite in the centers of the fiber aggregate, and sometimes a considerable proportion of unaltered mineral. Foliated talc accompanies the fibrous variety, being more abundant the further the process of alteration has gone. It is, however, a separate development deposited by the circulating waters which have taken the materials of the schist into solution.

About the usual output is reported from Vermont, but the industry declined in Massachusetts, the most important operator in that state, the Massachusetts Talc Co., having exhausted its deposit and undertaken an operation in Vermont. The production in the other Appalachian states was about normal.

In Canada, between 7000 and 8000 tons of talc were mined in the vicinity of Madoc, Ont., about one-half of the production being ground by the local mill of George H. Gillespie & Co., and the remainder shipped to the United States in crude form for grinding in domestic mills; three shafts were in operation at the Henderson mine. A shaft was sunk on property adjoining the Henderson and preparations were made for a new operation by a Chicago company; no production was made in 1912, however.

❋

Yuanmi Mill, West Australia

The new mill of the Yuanmi Gold Mines, Ltd., situated 60 miles south of Sandstone, West Australia, has been in successful operation since February, 1912 (*Monthly Journal,* Chamber of Mines of West Australia, Oct. 31, 1912). In designing this mill many points were to be considered. It was necessary that it should be designed to treat with the maximum amount of profit the blocked-out reserves of oxidized ore, and so arranged that it could be readily adapted at a minimum of expense to the subsequent treatment of the refractory antimonial ore from the sulphide zone. It is believed that the present design will meet these requirements.

The ore is hauled in side-tipping trucks, holding about 1¾ tons of ore, to the rock-breaking plant. The ore is dumped on a grizzly; the oversize is crushed by a 15x9-in. Blake crusher and the undersize from the grizzly joins the product from the crusher in a common chute. From this chute the ore is delivered to a belt-and-bucket elevator, the belt being 18 in. wide, of eight-ply canvas, rubber faced. The buckets are 16 in. wide, spaced 12 in. centers; the speed of the elevator is 190 ft. per min. The elevator discharges to a 10-in. belt conveyor, over the battery bin, which distributes the ore evenly in the bin. From the battery bin, which has a capacity of 300 tons, the ore is delivered to the battery boxes by Nelson feeders. Water is delivered to the boxes through a 6-in. pipe. Provision was made for an ample supply of water to the boxes, as preliminary tests showed that a high stamp duty could be obtained by using plenty of water.

The mill comprises 20 head of 1275-lb. stamps. The pulp from the battery flows to the No. 1 plunger of a 10x48-in. duplex Cornish pump. This plunger elevates the pulp to No. 1 diaphragm cone classifier, 5 ft. 6 in. in diameter by 8 ft. deep, installed above a 16x4-ft. tube mill. The overflow from this cone gravitates to the No. 2 plunger of the duplex Cornish pump and the underflow is piped to the tube mill and grinding pan. The discharge from the tube mill and grinding pan goes to the No. 2 plunger of the Cornish pump. The pump pit is divided down the center so that the pulps delivered to the plungers do not mix.

The product from the No. 2 plunger of the pump is delivered to a second diaphragm cone. The overflow from this cone gravitates to mechanical thickeners, of which there are two, and the underflow is returned to the No. 1 plunger of the pump for further classification in No. 1 cone and for regrinding in the tube mill and grinding pan. The tube mill consumes from 30 to 35 hp. and is driven from the mill countershaft. The thickened pulp is sent to three agitators which discharge to a vacuum filter plant. The gold solution, after being clarified, is precipitated on zinc shavings.

❋

Tungsten in Colorado in 1912

By R. D. George*

The year 1912 was a quiet one in the Boulder County tungsten area, of Colorado. The low price of tungstic acid was discouraging to those who produced ore and concentrates for sale. But it did not seriously interfere with those operators whose product went to their own manufacturing plant in the East.

The melting of the heavy snows of the winter of 1911-12, furnished so much ground water that many of the mines were flooded. Ordinarily the mines of the tungsten area have little or no water to contend with and so are not equipped with pumps adequate to meet the conditions which prevailed during the spring and early summer of 1912. As such an emergency is likely to be of rare occurrence, and as the market for tungsten was not encouraging, no frantic efforts were made to unwater the mines and put them into producing condition. As a consequence it was late summer before there was any marked activity in the leasing areas of the camp. Again, many of the mines have reached the depth at which their equipment is insufficient. This also contributed to the general inactivity.

The Wolf Tongue Co. enlarged its mill at Nederland, and installed a thoroughly equipped hydro-electric plant to furnish power for its mill and mines. It also adopted a new leasing system whereby leasers are supplied, free of rental, electrical machinery for sinking purposes. The company also pays one-half the cost of sinking. The leaser pays $20 per month for power, and a royalty of 25%. The company buys the ore on the basis of the percentage of tungstic acid it contains. The price per pound paid for tungstic acid, WO_3, rises as the tungsten content of the ore increases. The following schedule was adopted, Dec. 1, 1912:

PRICES OF TUNGSTEN ORE, DEC. 1, 1912

Tungstic acid in ore, %	Price per lb. of tungstic acid, cents	Tungstic acid in ore, %	Price per lb. of tungstic acid, cents
1- 4	5-11	35-39	28
5- 9	15-19	40-44	29
10-14	20	45-49	30
15-19	23	50-54	32
20-24	25	55-59	34
25-29	26	60	37½
30-34	27		

The Primos Chemical Co. had an active year. The tram from the Conger mine to the Lakewood mill was completed, and it is planned to extend it to the Gordon Gulch properties, making in all, about seven miles of track. The

*State geologist, Boulder, Colo.

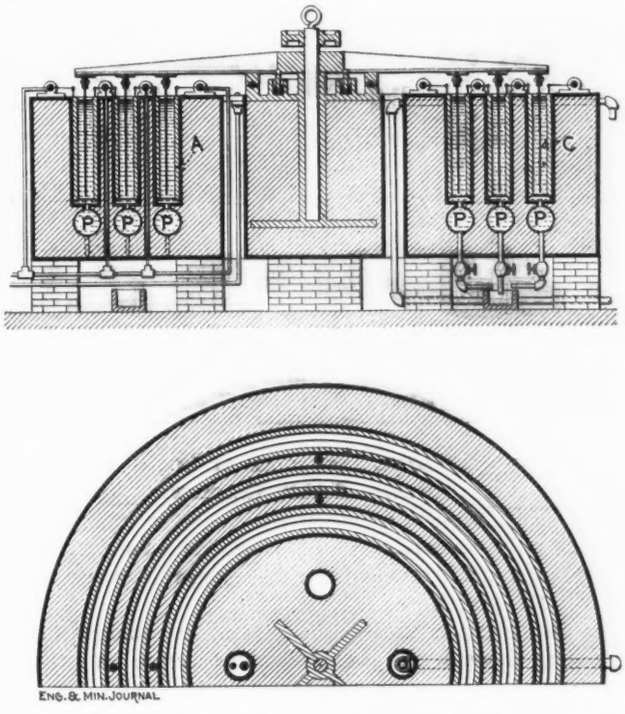
Conger shaft is being sunk to the 1000-ft. level and a new shaft is under way. It is reported that new and promising orebodies were opened both in the old mines and in new developments. The company had a good force of men at work practically all the year.

The leasers on the Rogers tract mined good ore, and made substantial shipments. The Colorado Tungsten Co., operating in Carrie Nation Park, erected a custom mill.

The Boulder Tungsten Production Co. did considerable development work in the Hurricane Hill area, and is planning to build a mill. The Beaver Creek, Rollinsville and Manchester Lake parts of the camp were not as active as usual. The production for 1912 was equivalent to 1400 tons of concentrates carrying 50% of tungstic acid.

Greenawalt Electrolytic Apparatus

In order to obtain coherent cathode deposits when using insoluble anodes, William E. Greenawalt has patented (U. S. pat. No. 1,043,096) the idea of mounting the cathodes so as to rotate around a central pier. In addition there are pockets below the anodes to catch the lead



GREENAWALT ELECTROLYTIC CELL

peroxide formed by the anode reactions, which peroxide it is purposed to reduce to metallic lead.

Apart from securing better deposits, the method is supposed to promote efficiency, as it secures circulation of the electrolyte and prevents polarization. In the accompanying figure, *A* represents the anodes, *C* the cathodes and *P* the pockets for the lead peroxide.

Garnet Industry in 1912

In 1912 the demand for garnet was strong, but the supply kept pace, so that prices were steady. Crude garnet was obtainable at $40 per ton, while the crushed and graded product sold uniformly at 6½c. per lb. The North River district in Warren County, New York, furnished practically the entire production, a small amount being imported from Spain. The North River garnet is superior to the foreign product and the latter does not seriously compete, except in the smaller sizes.

Garnet is chiefly used in the manufacture of garnet paper employed in the wood- and leather-finishing trades. The properties of garnet that peculiarly fit it for this service are that it is sufficiently hard to cut deep and fast at first, and further that it gradually wears away so as to impart the desired finish to wood or leather. No mineral has yet been found that possesses these two properties in so high a degree as garnet.

Goldfield Consolidated in November

During November, 1912, the total production of the Goldfield Consolidated Mines Co. was 27,775 tons, containing $451,986, or an average of $16.27 per ton, of which 27,402 tons were milled with an average extraction of 92.80%, and 373 tons were shipped, of an average value of $19.78 per ton, the net recovery from all ore being $15.12 per ton. The net realization was $250,370, or $9.01 per ton. During the month, 3528 ft. of development work was performed. The total cost of mining, development, transportation, milling, office and general expense was $6.11 per ton, distributed as shown in the accompanying table.

The estimated December production is as follows: Total tons mined, 27,946; gross recovery, $423,000; operating expense, $170,000; $253,000 net profits being realized.

GOLDFIELD CONSOLIDATED OPERATING COSTS, NOVEMBER, 1912

Mining, including stoping and developments	$3.41
Transportation	0.07
Milling	2.06
Marketing	0.06
General expense	0.49
Bullion tax	0.06
Marketing ore	0.03
Total cost of operation	$6.18
Miscellaneous earnings	0.07
Net cost per ton	$6.11

According to the monthly report of J. F. Thorn, general manager for the company, in the Combination mine, considerable new ore was developed, especially on the second level about 300 ft. northwest of the shaft. The 136BX sill was extended and produced 203 tons of ore, assaying $49 per ton. The 112-X drift being driven in the territory northwest of the 136-BX stope on the same level has cut a new oreshoot, and produced 101 tons of $36 ore. This new shoot should produce a large tonnage of excellent grade ore. The 210-X drift on the third level is being extended to find the downward extension of the 112-X ore.

In the Mohawk mine the 3-J sill, on the 150-ft. level in the old Sheets-Ish ground, was extended and produced 170 tons of $20 ore. The 3-P sill being cut on the oreshoot in 40 drift produced 243 tons of $16 ore. The 170-T stope being extended in the shoot cut by the 107-X drift on the 250-ft. level, under the old Sheets-Ish workings, produced 170 tons of $21 ore. The 490-R sill, on the intermediate between the third and fourth levels, was extended and produced 31 tons of $11 ore. The 490-B sill, on the same intermediate, just north of the 490-R, was extended and produced 574 tons of ore, assaying $18 per ton.

The 408-I stope in the Clermont has been brought up above the 600-ft. level and the sill of the 600 produced

805 tons of $21 ore. The development work in this mine during November was confined principally to the 1300- and 1400-ft. levels, where some promising discoveries were made. On the 1400-ft. level, about 430 ft. south of the shaft, the shale and latite contact was encountered Nov. 7, 1912, and after that date the crosscut was entirely in latite, well silicified and mineralized, and containing a little gold, silver and copper; there is every reason to believe that the downward extension of the 1300 ore bodies will be found on this level.

❋

Chemical Tariff Revision Hearing

On Jan. 6 and 7, 1913, the House Ways and Means Committee heard the representatives of the American chemical industries. Certain of the suggestions are of interest to mining men.

Henry J. Krebs, of the Krebs Pigment & Chemical Co., of Newport, Del., spoke of the danger to the American lithopone industry if the present tariff of 1¼c. per lb. was discontinued, as imports in the year ended June, 1911, even at that rate, amounted to 5,409,520 lb., and urged that the present tariff remain unaltered.

A committee representing the whiting manufacturers of the country argued for free chalk in the natural state, and ¼c. per lb. duty on whiting, or paris white, on the ground that no chalk was found in this country to compete with the European raw product, while owing to lower wages, the European costs of manufacture were less by about $4.50 per ton.

S. G. Boykin, of the Pratt Laboratory, Atlanta, Ga., and J. G. Sholes, of the Ohio Chemical Co., both argued for a duty on magnesium sulphate, both to protect the American manufacturer, and the California miner. The suggestion was for a continuation of the present 0.2c. per lb. rate.

The Roessler & Hasslacher Chemical Co. wishes either a rate of 2c. per lb. specific on potassium cyanide, and 2¾c. per lb. specific on sodium cyanide, or a uniform rate on both of 2¾c. per lb. The Merrimac Chemical Co. argues against a higher duty on bauxite, and a retention of those on alum, alum cake, alumina hydroxide, etc.

❋

The Pottery Clay Industry

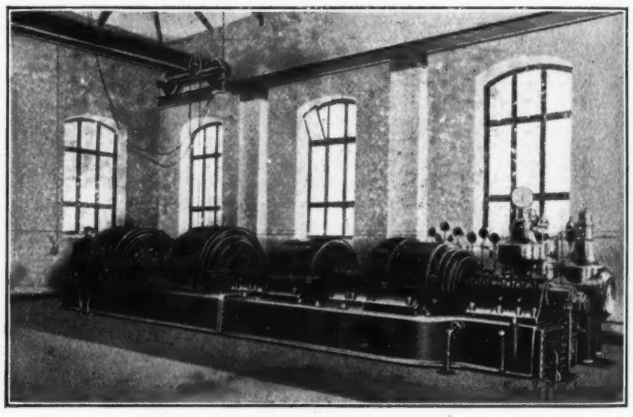
The total value of pottery-clay products manufactured in the United States in 1912 will probably show a slight increase over the business of 1911. Manufacturers appear to be reluctant about stating the business of the industry during the last year, but, although the value for 1911 was the greatest yet recorded, that year was one of only moderate prosperity, and the increase of 1911 over 1910 came from the lower grades of ware and porcelain electrical supplies, which facts would indicate a slightly greater volume and greater gross value of the business of 1912. In 1911 Ohio was the premier producer of pottery-clay wares, the output being worth $14,775,265; New Jersey was second with $8,401,941; the third in the list was West Virginia with $2,880,202, while New York was $2,178,364; Pennsylvania, $2,156,817, and Indiana, $1,004,737. These are the principal states in which pottery-clay wares are made, the total of all other states combined, amounted to but $3,451,856. Imports showed an increase in 1912 of about 15,000 tons over those of 1911, the imported wares being almost exclusively of the higher grades.

Turbo Compressors and Blowers

Recognizing the advantages of turbo blowers and compressors over reciprocating compressors in various fields, the Henry R. Worthington Co., 115 Broadway, New York, has acquired the exclusive rights for the manufacture and sale in American territory of the full line of turbo compressors developed by Pokorny & Wittekind, of Frankfort a-M, Germany.

Turbo blowers and compressors are similar in construction and principle to centrifugal pumps. The differences are principally such as are required to adapt the compressors for handling light and elastic fluids, instead of the heavy and almost incompressible water. The success of this apparatus, however, is largely a question of engineering and shop experience.

Turbo blowers and compressors consist simply of a stationary casing inclosing a rotating element supported in bearings. The casing may contain one or a number of impellers, depending upon the pressure desired. The impellers, carried upon a shaft equipped with a thrust bearing, constitute the rotating element. The casing has a suction and discharge opening and is divided into as many cells or stages as there are impellers. Leakage about the shaft and between the stages is prevented by labyrinth packings.



TURBO-COMPRESSOR INSTALLED AT ROYAL PRUSSIAN MINES, REDEN, GERMANY

The air enters the suction pipe at low velocity and in passing through the impellers the pressure and velocity are increased. Leaving the impellers the air is received by a ring of diffusion vanes which convert a large part of the velocity into pressure. Upon leaving the first set of diffusion vanes, the air, at reduced velocity, flows by easy curves to the influx chamber preceding the next impeller.

Some of the advantages claimed for turbo compressors over other types are as follows: High efficiency; low first cost; minimum attendance and upkeep charges; prime mover and compressor a direct-connected unit; use of motors and turbines as prime movers at most desirable speeds; absence of valves, of packing trouble and of vibration; long life due to few rubbing parts and rugged construction.

In the accompanying illustration is shown a turbo compressor installed at the Royal Prussian Mines, Itzenplitz Shaft, Reden, Germany. It is driven by a mixed-pressure turbine and has a capacity of 5000 cu.ft. per min. of free air compressed to 90 lb. gage pressure.

Transvaal Mining Notes

JOHANNESBURG CORRESPONDENCE

The rainy season which usually begins in September or October, has been delayed this year and up to the latter part of November the drought had not broken. Last season was dry also, the natives reaping poor crops and in parts of South Africa they are now practically starving. There are too few oxen to transport fuel and supplies. Vegetables, "mealies" and meat for natives are curtailed, and some of the mines within the city of Johannesburg are threatened with a water shortage. Recruiting for native laborers will be favorably affected. This is the season when natives leave the mines to sow and plow, but there are 1083 more laborers at work than in September, and 7766 more than in 1911. The mines are advancing natives $5 to assist their families.

There are several commissions now sitting. There is one inquiring into schemes for small holdings and housing for miners. Several mines have already started such projects themselves; 63 mines have provided houses for 3617 married employees and accommodations for 13,753 single men.

IMPROVED CONDITIONS AS REGARDS DUST

The government mining engineer has assured the tuberculosis commission that under present conditions a miner would take a lifetime to acquire silicosis. At the City Deep mine, excellent results have been obtained by using water mixed with molasses to spray the workings. This application of this material has been patented.

The freight on bullion to London is 5s. per 100 lb., or a total of $97,000 per year, while freight from England to New York is only 3s. 9d. Efforts are being made to obtain a reduction.

The Jupiter mine has been meeting with ore of satisfactory grade in the eastern workings at the deepest levels of nearly 5000 ft. In October, 42,800 tons of ore was crushed for a profit of £9570, and in November the profit was £10,500.

The reef in the incline from the Turf mine's shaft at 4200 ft. vertical depth maintains its steep dip of 40° and its excellent grade. The main Reef West mine has 685,000 tons, assaying 6.36 dwt. over a width of 56 in. in reserve. It is increasing its mill by 20 stamps, so as to crush 30,000 tons per month as soon as more native labor is available. The hoist installed in its western seven-compartment shaft can raise 150 tons per hour from 3500 ft., so that the capacity of this shaft with two hoisting engines is 7000 tons per 24 hours. The circular shaft at the New Modderfontein mine struck the reef at a depth of 2160 ft., the ore assaying 13.2 dwt. over a width of 48 in. This mine has 1760 acres of untouched ground to work, and its ore reserves show a working profit of £3,000,000, or £8 per share.

NEW MILL FOR NEW MODDERFONTEIN

It has been decided to erect at once a new mill at the circular shaft of the New Modderfontein mines and experiments have been carried out at the Village Deep on a system of direct treatment of sands and slimes in Merrill presses.

A prize has been offered for a method of estimating iridium in gold. The black sands and blanketings of several mines contain this metal with gold and the fire assay gives results that are too high in gold.

The Ziaplaats tin mines, working tin pipes in the Waterberg district, is in a bad way. Last year the acting manager and a consulting engineer reported that there was a reserve of 114,000 tons, assaying 4.5% tin. A new manager reports that about 69,000 tons of this ore cannot be found, and that the ore reserev is only about 36,000 tons, assaying 3.42% tin with the mine $26,400 in debt. The Leeuwpoort tin mine, adjoining the Rooiberg mine, is developing well and will shortly start crushing; 87,000 tons of ore, assaying 2½% tin, has been developed. The plant will treat 150 tons per day.

❋

Bureau of Mines Report

WASHINGTON CORRESPONDENCE

In his annual report recently published, Director Joseph A. Holmes, of the Bureau of Mines, reviews the work of this department and outlines the plans for the future.

INVESTIGATING MINERAL WASTE AND HEALTH CONDITIONS

Having in view the lessening of mineral wastes and the increasing of health and safety among persons engaged in various mineral industries, the bureau is conducting a series of investigations covering the field of miscellaneous mineral technology. These investigations are in charge of C. L. Parsons, chief of the division of miscellaneous mineral industries, with headquarters in Washington.

The work of the year was chiefly preliminary and consisted in large part of visits to manufacturing plants, mines and quarries, universities and technical schools, and gatherings of scientific men in order to gain information regarding the more important problems to be investigated.

A number of inquiries relating to safety and efficiency in various branches of the mineral industry were started. Bauxite quarries in Georgia and Arkansas and the fuller's earth deposits in Georgia, Florida and Arkansas were investigated with regard to possible improvement in present methods of mining and washing. The study of the methods of mining and preparing fuller's earth was supplemented by work in the laboratory. The results of the investigation indicate the possibility of greatly widening the market for domestic fuller's earth.

Mr. Parsons is making a study of the literature bearing on the question of occupational diseases, and is conducting examinations into technologic processes with a view to the possible introduction of improvements that would eliminate the poisonous or otherwise deleterious products, and better the general health conditions about plants for treating ores and minerals. This work supplements that done by the Bureau of Labor.

Investigations carried on by A. S. Watts, quarry technologist, in the kaolin, feldspar and quartz quarries of the Southern Appalachian fields in Virginia, North and South Carolina and Georgia, have shown that the methods of production and the quality of the product may be improved to the great advantage of the silicate industries; that it is highly probable that semikaolinized feldspar, many thousands of tons of which have been discarded as worthless, may be rendered available to the pottery in-

dustry; and that excellent ocher and mica, heretofore wasted in large quantities in washing kaolin, may be saved at a profit.

Treatment of Mineral Slimes

One of the investigations started is a study of the clay colloids and the effects produced by treating them with electrolytes. The purpose of this investigation is to gain some knowledge that may be applied to preventing the loss of substances of economic value in the slimes from plants for washing minerals or ores, and to devising methods of increasing the plasticity of clays for use in engineering construction.

Three methods of attacking the problem are being followed, as follows: (1) Observing the effect produced by varying content of water and by varying the concentration of the electrolyte upon the volume shrinkage of clay briquettes; (2) the effect of some electrolytes in increasing or decreasing flocculation in clay solutions; (3) the influence of some electrolytes upon the viscosity of clay solutions. This investigation is being carried on by Robert Back, junior chemist, under the direction of the chief of the division.

Investigation of Rare Minerals

Investigations of certain rare minerals are to be conducted by R. B. Moore, physical chemist, and associates, who will have a laboratory in Denver, Colo. The work already outlined includes an investigation of the production of carnotite and pitchblende in the United States, the present status of the mining and treatment of these ores, and a study of the best methods of handling and treating them, especially those of low grade. It also includes an examination into the possibility of finding ores containing these rare earths about the waste piles of a number of mines.

Other proposed investigations relating to radium comprise methods of separation and fractionation of radium salts, methods of estimating radium in rocks and minerals, the radium content of native carnotite, and a possibility of making meso-thorium a substitute for radium, and an investigation of native carnotites for their helium content. The production and treatment of vanadium, tungsten and other rare metals are to be studied.

Other investigations under the direction of the chief mineral chemist include: An examination of the placer washings and tailings from operating mines, to be made in the hope of developing means of conserving the platinum, gold, silver and other material of possible value; an investigation of brass and other nonferrous alloys, including the examination of different types of furnaces under comparable conditions, with a view to increasing efficiency and preventing waste; also the modification of existing electric furnaces or the development of a new electric furnace in the hope of preventing the immense losses of zinc that occur in making brass and other zinc alloys.

In addition to the inquiries and investigations now in progress and described above, the bureau is arranging with mining and metallurgical engineers of large experience to prepare for publication reports setting forth the progress and present condition of the more important branches of the mining industry. These reports are intended to let the intelligent citizens of the country understand how their mineral resources are being used and what good results are being accomplished through their use toward the permanent upbuilding of the nation. The reports now well under way are the following:

(1) "Iron Mining in the United States," by Dwight E. Woodbridge. This report will describe the various operations from the opening of the iron-ore fields to the dumping of the ore in the stockyard at the furnace. (2) "The Iron and Steel Industry in the United States," by John Birkinbine. This report will describe the more important operations of the industry; the development and distribution of the iron and steel plants in the United States; the part played by the industry in national development; and safety and sanitation problems. (3) "The Smelter Industry in the United States," by C. H. Fulton. This report will describe the nature, extent, distribution and operations of the smelting plants in the United States, their development, their products, the part they have played in the development of the mining industry and of the country, and safety and sanitary conditions at smelting plants. (4) "The Sampling, Testing and Assaying of Ores and Metallurgical Products," by W. J. Sharwood, T. R. Woodbridge and Edward Keller. (5) "Safety and Efficiency in American Tunneling," by D. W. Brunton and J. A. Davis.

Data are now being brought together for similar reports on the quarry industry, the lead and zinc industry, the copper industry, the precious-metal industry, the coal industry, the petroleum industry, and miscellaneous mineral industries.

International Atomic Weights

The atomic-weight figures herewith given, with the exception of the newly recognized holmium, 163.5, are the same as those given in the Journal of Jan. 13, 1912. However, as it is convenient to have such data in the current year's volume, they seem worth reprinting. The Eighth International Congress of Applied Chemistry has recommended that these weights be used in all commercial work until 1915, while at least for the present year, they are sanctioned for scientific work also.

INTERNATIONAL ATOMIC WEIGHTS, 1913.

Element	Symbol	Weight	Elements	Symbol	Weight
Aluminum	Al	27.1	Molybdenum	Mo	96.0
Antimony	Sb	120.2	Neodymium	Nd	144.3
Argon	A	39.88	Neon	Ne	20.2
Arsenic	As	74.96	Nickel	Ni	58.68
Barium	Ba	137.37	Niton	Nt	222.4
Bismuth	Bi	208.0	Nitrogen	N	14.01
Boron	B	11.0	Osmium	Os	190.9
Bromine	Br	79.92	Oxygen	O	16.00
Cadmium	Cd	112.40	Palladium	Pd	106.7
Caesium	Cs	132.81	Phosphorus	P	31.04
Calcium	Ca	40.07	Platinum	Pt	195.2
Carbon	C	12.00	Potassium	K	39.10
Cerium	Ce	140.25	Praseodymium	Pr	140.6
Chlorine	Cl	35.46	Radium	Ra	226.4
Chromium	Cr	52.0	Rhodium	Rh	102.9
Cobalt	Co	58.97	Rubidium	Rb	85.45
Columbium	Cb	93.5	Ruthenium	Ru	101.7
Copper	Cu	63.57	Samarium	Sa	150.4
Dysprosium	Dy	162.5	Scandium	Sc	44.1
Erbium	Er	167.7	Selenium	Se	79.2
Europium	Eu	152.0	Silicon	Si	28.3
Fluorine	F	19.0	Silver	Ag	107.88
Gadolinium	Gd	157.3	Sodium	Na	23.00
Gallium	Ga	69.9	Strontium	Sr	87.63
Germanium	Ge	72.5	Sulphur	S	32.07
Glucinum	Gl	9.1	Tantalum	Ta	181.5
Gold	Au	197.2	Tellurium	Te	127.5
Helium	He	3.99	Terbium	Tb	159.2
Holmium	Ho	163.5	Thallium	Tl	204.0
Hydrogen	H	1.008	Thorium	Th	232.4
Indium	In	114.8	Thulium	Tm	168.5
Iodine	I	126.92	Tin	Sn	119.0
Iridium	Ir	193.1	Titanium	Ti	48.1
Iron	Fe	55.84	Tungsten	W	184.0
Krypton	Kr	82.92	Uranium	U	238.5
Lanthanum	La	139.0	Vanadium	V	51.0
Lead	Pb	207.10	Xenon	Xe	130.2
Lithium	Li	6.94	Ytterbium	Yb	172.0
Lutecium	Lu	174.0	Yttrium	Yt	89.0
Magnesium	Mg	24.32	Zinc	Zn	65.37
Manganese	Mn	54.93	Zirconium	Zr	90.6
Mercury	Hg	200.6			

CORRESPONDENCE AND DISCUSSION

New British Guiana Mining Law

While I was recently in Georgetown, British Guiana, a law was passed, taking effect immediately, by which none but British subjects could, either as individuals or corporations, acquire any lands classed as oil-bearing, and foreign shareholders in oil companies must be in the minority. There are a number of annoying restrictions in the law besides those mentioned.

The law was drafted by order of the Home Government, through the Secretary of State for the Colonies. All of the English colonies in the West Indies have been instructed by the Home Government to insert similar clauses to those I have mentioned in their laws for the acquiring of oil lands. The people generally in the colony are opposed to the law on the grounds that it will keep much American capital out of the country. The law mentioned is certainly a most peculiar one for the English government to enact; so far as I can learn it is the only law now in force in any of the English possessions, restricting or limiting in any way their development by foreign capitalists.

There is a rather promising oil field with some producing wells on the island of Trinidad. The British Guiana field is supposed to be an extension of the Trinidad field, although no oil has so far been discovered in the Guiana field. The only reason given for thinking oil may exist there, is the presence of small quantities of asphaltum. A small amount of oil is said to have been found on the island of Barbados. This field cannot be extensive as the area of the island is limited. As prospecting for new oil fields is now attracting much attention, this new oil act of the British government will probably be of interest to the JOURNAL readers.

ALFRED H. HALE

New York, Jan. 6, 1913.

The Purity of Metals

Regarding the editorial on the above subject in the JOURNAL of Nov. 23, 1912, together with the abstract of the article on the American standard copper specifications, it would appear that the failure to appreciate that the specification of the Society for Testing Materials already adopted dealt solely with electrolytic copper, has caused much unnecessary anxiety to some of our European friends. The Testing Materials Committee is now working on the subject of alloy copper, and it will certainly embarrass it in its work if such attacks are continued.

In regard to the difficulty of turning out copper of high copper content, I have recently seen the figures of a commercial refinery, on the average wirebar content for several years past, which are: 99.93 in 1909; 99.93 in 1910; 99.94 in 1911, and 99.95 in 1912. From this it would appear that Mr. Lewis greatly exaggerates the difficulty of passing the chemical tests as now outlined by the Society for Testing Materials. The copper is being carried to a rather higher pitch than formerly, a full rounded set being now regularly required.

This probably results in a little softer material, and while it requires a little different treatment in order to get the peculiar combination of tensile strength and ductility demanded by some of the hard-drawn specifications which use ductility tests more or less dependent on skin effects, it gives a softer product when annealed, thereby giving less breakage under the constant vibration experienced in rapidly revolving armatures.

Apart from all questions of greater purity of the original copper, obtained by higher pitch in the refiner's reverberatories, and to better electrolytic work with purer electrolytes, I believe the average wire-drawer has not sufficiently considered the question of gaseous contamination. In the JOURNAL the effect of this on oxygen analysis has already been noted, p. 1179, June 15, 1912, and no investigation of the problems of wire-drawing will ever be complete until this side is carefully studied. Whether a highly pyritic coal may not do great damage in an annealing furnace heated by direct contact between the combustion gases and the copper is an important question. I think it may.

J. T. SMITH.

Perth Amboy, N. J., Dec. 13, 1912.

Review of Butte Geological Report

The commercial value of geological work in mining operations has been generally established in the last 20 years, and nowhere has it been more useful than in the underground development of the Butte, Mont., copper properties. Originally forced upon the companies by bitter litigation, compelling careful determination of apex rights to the rich orebodies found beneath a zone of leached and frequently barren vein matter, the work has been continued by the larger companies, now combined and used both in development and litigation.

The U. S. Geological Survey report of the district made by Prof. Emmons and his assistants and published as a geologic folio by the government, was followed by an investigation, made by me, assisted by Professor Barrell, of Yale College, Reno Sales, of Butte, and others. The report of this work was submitted for publication in 1907 and appeared five years later in book form. For this delay, the author is not responsible, nor is the reason for it known to him. Litigation was responsible for delay in preparation, not publication.

In this interval of five years, development work has been rapid. It is safe to say that the amount in this period has equaled if it has not exceeded that done prior to that time. It is not surprising that many new facts relating to structures and ore deposits are now available.

The review of the government's memoir on the Butte district[1] was entrusted to the chief geologist of the Ana-

[1]Eng. and Min. Journ., Oct. 19, 1912.

conda Copper Co., and it is perhaps unreasonable to expect unbiased criticism from him, even though the involved structure of the district permits honestly differing opinions. Notwithstanding this handicap the reviewer has rendered excellent service in writing an intelligent summary of the more notable features of the report and calling attention to the various errata resulting from hasty proofreading of text and drawings made without access to original material. As, however, some of his statements are unwarranted, a reply, even a delayed one, entailed by prolonged work in the field, is called for.

Even with due allowance for peculiarities of temperament and prejudice, the remark that a statement in the report has no foundation in fact, is unjustifiable. To expect the correlation of material accumulated in five years and its presentation in printed form in a year's time is unreasonable. As already stated, litigation was responsible for delay in preparation of the report, not its publication after the manuscript was submitted.

The monograph is notable for the detailed unravelment of the complicated vein systems, the work having been planned with especial regard to the late Professor Emmons' insistence upon structural relations as a guide to the location of profitable orebodies.

The inference that the outcrop map has not been revised must certainly be the result of hasty and careless observation. The wretched appearance, as much deplored by me as by the reviewer, and for which the illustration division of the Survey and the engraving company which secured the contract must share responsibility, is admitted, but surveyed outcrops do not change from year to year, and if correct in 1897 are still correct, while the new map shows faults, veins and dikes whose blind or obscure outcrops prevented mapping in 1906, as, for example, the Blue Vein, Mountain View fault, Jessie and Blue Jay veins.

Secondary enrichment having been generally accepted after its presentation by me and confirmation by Emmons and Van Hise, has not been exhaustively treated in the report. Careful studies of the opaque minerals on the stage of a petrographic microscope failed to give decisive results and the field evidence sifted out and compiled for presentation was, fortunately it turns out, omitted from the report.

I say fortunately, since the recent methods of metallographic research in the study of opaque minerals by L. C. Graton and his associate, Professor Campbell, have given reliable criteria for the recognition of secondary and of primary ores. It may be noted that Professor Graton tells me his work shows that chalcocite is sometimes secondary, sometimes primary, thus sustaining the opinions given in the Butte report. Concerning enargite, of which the reviewer makes caustic remark with the inference that the mineral is secondary, the slides shown by Professor Graton in his lecture before the New York section of the American Institute of Mining Engineers, last winter, showed clearly that his conclusions then expressed that it was primary, sustain my deductions.

As governmental reports are all too often only heard of by engineers when the edition is exhausted, the review served a useful purpose in calling attention to the existence of the report, which despite its faults has already proved valuable to many engineers, who have so advised me. The development of great orebodies of blende in the eastern extension of the Rainbow lode, north of the developed copper area of the district, has caused a further study of the district by a member of the U. S. Geological Survey, and it is hoped his report will supply the particular information so earnestly desired by the reviewer.

WALTER HARVEY WEED.

New York, Jan. 9, 1913.

Ruthenium in Osmiridium

In the JOURNAL of Nov. 12, 1912, under the title "Iridium in American Placer Platinum," by Frederick W. Horton, are given various analytical data upon the composition of platinum minerals.

For better understanding of this article, it should be remembered that the ores of platinum contain: (1) Platinum minerals, which contain platinum, palladium, iridium, rhodium and gold, as well as the base metals, iron, copper, chromium, titanium, etc.; (2) osmiridium, which is composed of osmium, ruthenium, iridium and iron; as Ste. Claire, Deville and Debray have demonstrated. This last mineral is associated to a greater or less degree in the platinum minerals, although, perhaps in certain cases in certain regions is to be found without being mixed with any platinum minerals, but associated with gold.

In Mr. Horton's paper there is no mention made that ruthenium has been determined in osmiridium and one would suppose that there was only a trace of it present. However, according to the analyses made by Ste. Claire, Deville and Debray[1], ruthenium attains the following proportions in the ores mentioned below: Colombian osmiridium, 6.37%; Californian, 0.50%; Australian, 5.22%; Russian (in small spangles), 8.49%; Russian (in scales), 4.68 per cent.

In some recent work done by me in collaboration with Leidié, thanks to a new method of attack[2] and of determination of the metals in platinum ores, we have invariably shown the presence of ruthenium.

Osmium residues derived from commercial gold and purified in the laboratory of Essaies de la Monnaie, of Paris, which have been sent to us by Riche, the director, have been determined by us to have the following composition: Osmium, 54.368%; iridium, 35.504; ruthenium, 8.172; iron, 1.44; undetermined, 0.51%[3]. Further, we have determined that the osmium contents vary widely, while the ruthenium preserves an almost constant proportion with iridium, which permits us to suppose that a combination exists which might be termed a ruthenide of iridium, associated with more or less osmium, without this last element forming any definite combination. At present, pressure of work has prevented the pursuit of the solution of this question which I have reserved for solution at a later date. I send you extracts from the works cited in the footnotes, in which you will find the methods of determination given which have served us in these researches.

L. QUENNESSEN.

Paris, Dec. 16, 1912.

[We hope later to present abstracts of the papers mentioned by M. Quennessen.—EDITOR.]

[1]Ann. Chim. Phys. (3), vol. LVI, p. 481.

[2]Bull. Soc. Chim. de France, 3rd Series, vol. XXVII, p. 179; ibid, vol. XXIX, p. 801; Journ. de Pharm. et de Chim., Aug. 1, 1903.

[3]Administration of Moneys and Medals, "Report to the Minister of Finance," 1903, Note A, p. XXIX.

EDITORIALS

The Prospects for Copper

The December statistics of the Copper Producers' Association, together with the extensive compilation for 1912 that we presented in our last issue, render a fairly clear view of the situation now existing in the copper industry. A year ago the market had just experienced a decided turn for the better, but this was so unexpected and so sudden that most of the experts were skeptical respecting maintenance of the improvement. The old producers had resumed their former rate of output, and a new production of about 12,500,000 lb. per month was at hand. It stretched imagination to foresee any such increase in consumption as would take care of this great augmentation of supply.

In fact, while Europe continued to maintain its great consumption, America experienced a remarkable increase, in anticipation of which American manufacturers early in the year began to buy ahead and shoulder a part of the accumulated stocks, which for a long time previous they had refused to do. Strange to say, also, the production of refined copper for a long time failed to show any increase. The result of these conditions was a steady and large diminution in the stocks and a steady and large advance in the price for the metal. The production of the smelters was, however, increasing steadily.

Just how the failure of the refiners' production to increase was managed need not now be inquired into. In the second half of 1912, their production began to increase largely, and the accumulation of refined stocks began to increase also. It was sought by the principal producers, however, until a week ago, to maintain the maximum price. What has happened during the last week is related in the market report, on another page, which was, of course, simply what was to be expected.

Among the statistical results of 1912, we find that the world's production of copper increased from about 887,000 metric tons in 1911 to about 1,005,000 metric tons in 1912. The stocks in Europe and America decreased by about 46,000,000 lb., but the surplus of American smelters' production over the refiners' was about 65,000,000 lb., which must later materialize; and, consequently, the world's production probably exceeded the consumption, although the statistics of refined copper do not show this. The invisible stocks, i.e., stocks in the hands of manufacturers, must necessarily remain a matter of surmise only. Toward the end of 1912, such stocks probably were reduced from what they were during the middle of the year, but as to how they compare with such stocks at the beginning of the year, no one can say with any certainty, far less with precision.

With respect to the matter of price, a study of the chart of monthly average prices for all the metals furnishes ideas worth consideration. The line for spelter shows a steady but moderate ascent. That for lead shows an ascent and a decline. That for pig iron ran level until July, when it began to rise, slowly at first, more rapidly later on. The line for copper exhibits no parallelism with any of the others. After a small recession in February, it rose steeply to June, and then ran about horizontally during the remainder of the year. The line for pig iron especially reflects normal and true conditions, as we now know the history of the year. The erratic divergency of the line for copper indicates in itself the action of artificial influences and excites the suspicion that the rise in the price for this metal, which undoubtedly was justified partly by natural conditions, was nevertheless caused to happen several months too soon. As a consequence of such anticipation, the inference may be drawn that the increased production of 1912, which was delayed, may show its effects, although perhaps in a moderated way, in 1913. This is probably the meaning of the large increases in refiners' production and stock that lately we have been witnessing, including the December returns.

Such being the circumstances, the big producers were not, of course, able to maintain the market at the point where for about six months they had sought to peg it. Their recession from their position, which took place during the current week, was doubtless the best thing that could have happened for the industry in general. Nothing will so restore confidence in the copper market as to cause it to be freely and openly competitive, with an absence of ideas about starving the consumer, and rather the exhibition of a tendency to make concessions in price to interest manufacturers and promote consumption when demand otherwise relaxes.

It looks as though the copper market had now simply gone stale. It does not look as though any great disaster, or serious set-back, is threatened. We enter 1913 with no such great volume of impending new production as we had when entering 1912. The trouble is that some of the most influential producers were then in too much of a hurry and were not willing to let things run their natural course. The high price for the metal has stimulated a good many small mines, whose aggregate production is considerable, as is always the case, but so far as we can see now there are no such great blocks of new production coming in the near future as we learned to expect previous to 1912. The Inspiration will hardly begin to produce before 1914, and Chuquicamata hardly before 1915. Braden, Ray, Chino and Bingham may increase their outputs during 1913, but many of these, and of the older producers also, are for the moment checked by shortage of labor, a condition that is likely to prevail so long as general prosperity continues, and of such continuance we do not feel much doubt. By the time that the new copper now in sight has materialized, it probably will be wanted, and wanted at a good price. If, in the meanwhile, we have a moderate recession in price, the result, we think, will be salutary. The industry may congratulate itself unqualifiedly that the recent conditions have dispelled the notion about advancing the price of copper to 20c. a pound, which, a little while ago, was seriously entertained. The more interference with the operation of nature, the more serious are the consequences. Fortunately the "pegging" of the copper market was not tried very long.

American Institute of Mining Engineers

The members of the Institute have received this week certain important documents that are the result of the constructive work which has been going on during the year 1912. The Institute has been growing in several directions, and all of its members have probably felt, to a greater or less degree, the "growing pains" incidental to development. While the "pastoral letter" of President Kemp, which accompanies some of the documents, has described them as fully as was probably necessary for the information of those members who have been most in touch with the Institute affairs, there is one point which it seems to us should be somewhat further explained.

The government of the Institute has heretofore been carried on by a council and board of directors, but it was reported at the adjourned meeting of the Institute, held on Oct. 7, that this dual control was not only cumbersome but ineffectual, and, moreover, dissatisfaction with it had previously been expressed by many members. At that meeting, there were 52 members present in person, 1021 represented by proxies held by Messrs. Eilers and Kirchhoff, and 275 held by Messrs. Corning and Finlay. This representative meeting passed the following resolution:

RESOLVED, That it is the sense of this meeting that the dual control system of government should be abolished, and to that end the Committee on Amendments to Constitution, Messrs. Richards, Kirchhoff and Rand, be requested to take action, and that the Council be directed to take action toward unifying the two governing bodies. . . . .

The meeting adjourned to Nov. 12, to hear the report of this committee, and for such other business as might come before it. On that date, the records show that a resolution moved by Prof. Richards and seconded by Mr. Kirchhoff, was unanimously adopted, ordering a change in the present articles of incorporation, eliminating the council and increasing the board of directors from nine to 24. Carrying out this mandate, at a joint meeting with the council, the board of directors authorized the amendment, subscribed the necessary legal papers, and the change was approved by the courts. The result is that on and after Feb. 18, 1913, the council is done away with, except insofar as it may be created as an advisory body under the board of directors, and the affairs of the Institute will be carried on by a board of 24 directors.

The new constitution, which has been the work of a very painstaking committee, has been approved informally by votes of the Institute at Cleveland and in New York, is now before the membership, and so far as we have heard, is not opposed by any, excepting only concerning two or three details, regarding which the membership has been asked to express its preference.

Another circular, signed by Messrs. Charles Kirchhoff and Karl Eilers, has been sent to the members, intimating that the committee on nominations had recommended, or is about to recommend, a secretary other than the present incumbent, Doctor Struthers. The report of the nominating committee is published elsewhere in this issue. The committee was made up of representative men from different sections, and it is pretty well known that there was very active candidacy for some of the offices, which is a healthy sign of progress, for heretofore the nominations have sometimes gone begging, and the membership at large have taken comparatively little interest in the annual meeting. The committee has been criticized, we hear, for its failure to include on its list the names of present councilors, whose terms of office have not expired. We understand that independent nominations of these gentlemen will be made, giving thus the membership of the Institute an opportunity to make its own selections. This, of course, is just as it ought to be.

The office of secretary of the Institute is honorable and influential. The committee's nomination of a secretary must be on the assumption that the new constitution may not be adopted, or its going into effect postponed, for under it, it will be noted that the secretary is elected by the board of directors. If the election is held under the present constitution, which provides for a council and the election of secretary by the membership at large, these councilors, and naturally the secretary of the council, cannot have any legal recognition under the laws of New York, as the lawyers have advised, or under the amended certificate of incorporation, so that it would seem that the friends of the rival candidates should make their appeals to the new board of directors rather than to the membership at large.

Whatever be the result of the balloting, the best friends of the Institute are united and sincere in the hope so adequately expressed by a speaker at the Cleveland meeting, that the membership will hereafter receive "more papers and fewer proxies," and that it will settle down to constructive work under a representative board of directors, representative, not of factions or men, but of a united body of earnest and progressive engineers.

The Prospect for Spelter

The disappearance of stocks to almost the vanishing point, the importation of a considerable tonnage of European spelter, and the maintenance of a high level of price during 1912, indicate that the huge domestic production (about 348,000 tons) required to meet the domestic demand was accomplished only by greatly straining the abilities of the smelters. It is probably unreasonable to expect that the demand in 1913 will increase in the same extraordinary ratio as in 1912. It will be fortunate if it does not, inasmuch as there is not now in sight so large an increase in smelting capacity as at the end of 1911. However, the additions that are being made are of a substantial character, being wholly among the coal smelters, and being made chiefly at works that are already going concerns, they will be of relatively speedy realization, it being much easier to add new furnaces to old works than to build new works completely.

At the end of 1911, American smelters had about 84,600 retorts, excluding a few at certain works that are unlikely to be used again, and at the end of 1912 about 100,000. The production of spelter in 1911 and 1912 was about 296,000 and 348,000 tons, respectively, in each year about 3.5 tons per retort, using the number at the end of the year. This quotient is not a precise factor, because the divisor is not the average number of retorts; nor is the production during the year a uniform thing. But accepting the figure roughly, it will give us an idea of what may be expected, and we may guess reasonably that the 10,000 retorts now building will enable us to produce about 35,000 tons more of spelter in 1913, if other things remain the same.

However, other things will not remain the same, inasmuch as it is certain that some of the gas-smelting capacity will pass away, one of the works at Bartlesville hav-

ing already become idle, temporarily at least. Yet, in spite of the gloomy forebodings in 1912, both Kansas and Oklahoma on the whole have returned increased outputs. If we may judge from the past experiences in Indiana and at Iola, Kan., the gas-smelting business will not be snuffed out summarily, but will maintain a fitful existence for many years after shut-downs have become general, i.e., works will be closed under certain conditions and started up again under others.

It is, perhaps, overlooked that the maintenance, and even increase, of the Kansas-Oklahoma production, has been effected by the high level of spelter price and large margin on ores, which have permitted the smelters to secure and use gas at greatly increased expense. A contraction in the favorable conditions will restrict that ability. In other words, a decline in the price for spelter and especially in the margin on ore will tend to excise gas smelting capacity more rapidly than otherwise.

Undoubtedly Europe will continue to play an important part in our market during 1913. The production over there has been increasing materially and the consumption has lately not been increasing, to say the least. Stocks have been accumulating, though not yet in a very troublesome way. However, the managers of the convention have several times deemed it wise to relieve themselves of round lots for export to America at private sale. We shall not be surprised to see repetitions of such procedure. Having in view that situation and our own new production, both of ore and spelter, we are inclined to the opinion that the general tendency in the American market will be toward easier conditions.

BY THE WAY

The Old Dominion Copper Co. has put in operation two new basic converters of the Great Falls type in its smelting works at Globe, Ariz.

⁂

A dispatch from Ekaterinburg states that the workman Sedelnikoff, accused of assassinating Horace H. Emerich by a shot fired through the window of his residence at Kyshtym on Oct. 20, 1911, was convicted and sentenced to eight years' imprisonment at hard labor. A later dispatch states that he retracted the confession which he made at the preliminary inquiry, declaring that this had been forced by the police who had beaten and starved him for a number of days.

⁂

Recent news from Mexico indicates that there are still revolutionary storm centers that are as dangerous as during the early days of the revolution. A dispatch of Jan. 11 states that the mining camp of Indé in Durango was besieged, and much concern was felt over the staff of the Indé Gold Mining Co. and other Americans in the camp. Interesting in this connection is a Washington dispatch of the same date, which states that John Hays Hammond has proposed to the Mexican government that it permit him to go with two armed companions into the Yaqui territory with the object of attempting to settle by conciliatory methods the Yaqui Indian troubles. Mr. Hammond proposes to take with him Maj. Frederick Russell Burnham, of Pasadena, Calif., and a Yaqui guide. Mr. Hammond and associates have extensive holdings in the Yaqui country, amounting to several hundred thousand acres, which are to be irrigated by diverting the water of the Yaqui River. According to the dispatches, Mr. Hammond hopes to induce the Yaquis to return to farming, and will try to persuade the Mexican government to grant additional land to the Indians.

⁂

Alchemy will not down. A marconigram of Jan. 9 says: "That there exists a company for the making of gold by alchemy was disclosed in a case heard in the London Sessions, when two men were charged with stealing alchemic gold of the value of $2250 from the prosecutors, the Alchemy Gold Co., Ltd. The men were convicted, and sentenced to terms of imprisonment." We do not understand why the alchemists should be so vindictive when they have discovered the secret of making gold; still, it may be that the costs amount to something like $20.67 per oz., plus the labor of putting it into the plant and printing stock certificates.

⁂

According to press dispatches, three men working in the Imperial mine, near Joplin, Mo., on Jan. 3, had prepared a round of 55 shots, and having lighted the fuses, had been signaled to be hoisted to the surface. The hoisting engine had in the meanwhile become deranged and failed to work when the signal was given. The shots went off and buried the men under the rock dislodged. The precise particulars have not yet been communicated to us, but on the face of the press reports, it is probable that the lives of these men would have been saved if the shaft of the mine in question had been provided with a ladder-way, which ought always to be required. Mines in the Joplin district are conspicuous by the absence of ladder-ways in their shafts.

⁂

Discussing the paper on the "Metallurgy of the Homestake Ore," presented recently by Messrs. Clark and Sharwood before the Institution of Mining and Metallurgy, Hugh F. Marriott said that the first thing he noticed on reading the preamble was the similarity of the conditions at the Homestake mine to those of the Rand: The high wages, the high freight rates and the high altitude. That led him to inquire in what way the average results at this mine compared with those of the Rand. He had found that the results showed a remarkable degree of similarity. The authors mentioned that the output from the property had been about $100,000,000, of which it had paid $27,000,000 in dividends. The record of the Rand showed that from the commencement of operations on the gold field to the present day about 26% of the output had been distributed in dividends; and that during the last three years the average might be taken as more representative of systematic working, than the figures which included all the early days; the dividends of the last three years worked out at little over 27%. With regard to comparison of detail results, Mr. Marriott said the Rand costs were about 10s. per ton higher; but on the other hand, the Rand ore gave nearly 10s. per ton extra yield, which preserved the balance. It appeared that the difference of 10s. in working expenses was mainly accounted for by the fact that on the Rand it was lode mining at narrow widths, while at the Homestake it was, in the main, quarrying in masses.

American Institute of Mining Engineers

At the annual business meeting of the institute, to be held on Feb. 18, 1913, the members will be asked to vote on the new constitution and by-laws prepared by Messrs. Joseph W. Richards, Charles Kirchhoff and Charles F. Rand, acting as a special committee. The principal changes are summarized herewith:

Constitution

Art. II, Sec. 2. A new class of junior members is established and reduced dues for them are provided under Art. III.

Art. IV, Sec. 4. Letter ballot is substituted for proxy voting.

Art. V, Sec. 1-3. A single board of 24 directors is substituted for the present board of nine directors and for the council of 17 members. Only 15 of the 17 councilors are added to the existing nine directors, because the president is now a member of both bodies, and because hereafter the secretary may or may not be a director. The secretary is to be elected by the board of directors and not by the institute; his office being an administrative one, his authority should come from the board, which is charged with the responsible administration of the institute.

Sec. 5. The office of secretary emeritus is constitutionally established.

Sec. 8. The entire board may delegate certain circumscribed authority to an executive committee.

Sec. 9a. Attendance on meetings of the board is assured to chairman of local sections.

In By-law XIII the geographical distribution of directors is prescribed proportionally to the distribution of the members. This provision is placed in a by-law to admit of easy revision because of the shifting of members. Further conditions are contained in Art. VII, Sec. 1, of the constitution.

Art. VI, Sec. 1. Monthly meetings of the board, except in July and August, become mandatory.

Sec. 2 Meetings of the board, other than the annual one, may be held elsewhere than at headquarters.

Art. VII, Sec. 1. A committee on nominations is established, none of the members of which are to be on the board of directors. The distribution of candidates is so prescribed as to make a quorum of the board a possibility. Times for the submission and circulation of nominations are established.

Sec. 2. Letter ballots are prescribed.

Sec. 3. Special provision is made for the election in February, 1913.

Art. VIII, Sec. 1. A committee on papers and publications is established.

Art. X. Amendments are made possible under the new conditions.

By-laws

No. VIII prescribes for the finance committee the preparation of a budget, the audit of bills, etc.

No. XI provides the title of "Fellow of the Institute" for members prominent in the profession. A nucleus of 25 fellows is to be designated by the board of directors; those so elected shall thereafter nominate and elect additional fellows.

No. XIII prescribes the geographical distribution of directors.

No. XVI assures the members of the publications. No mention of this obligation is in the present by-laws.

No. XVII makes provision for local sections.

No. XVIII provides for technical committees, the newer name for divisions.

No. XIX provides for affiliation with sister societies.

No. XX provides for affiliated student societies.

No. XXI makes more liberal provision for amendments and for the information of the membership about them.

Corning and Stone Amendments

Two amendments each to the constitution and the by-laws are also offered by Messrs. C. R. Corning and George C. Stone. One to Art. II of the constitution excludes from those eligible for junior membership "persons under 30 years of age engaged in learning mining, metallurgy or geology under the supervision of a member of the institute." One to Art. III provides that any member in arrears for four months shall no longer receive the Bulletin. One proposed amendment to by-law VI prohibits the assistant treasurer from holding any other office. By-law XVII, covering the matter of local sections, is changed, so as not to provide for any financial help to be extended to them by the board of directors, nor for the control of their papers by the institute. In general it tends to make the local sections more independent.

⁂

Ballot of American Institute of Mining Engineers

The official ballot of the American Institute of Mining Engineers under the present constitution is given below.

For officers and members of the council: President, Charles F. Rand, New York; vice-presidents, C. W. Merrill, San Francisco, T. H. Leggett, New York, J. A. Holmes, Washington; councilors, H. L. Smyth, Massachusetts, F. W. Denton, Michigan, E. V. d'Invilliers, Pennsylvania; secretary of council, Bradley Stoughton, New York.

For officers and members of the board of directors: President, Charles F. Rand, New York; past presidents (one for one year, one for two years), Charles Kirchhoff, New York, one year, James F. Kemp, New York, two years; vice-presidents (two for one year, two for two years, two for three years)—for one year, Sidney J. Jennings, New York and George C. Stone, New York; for two years, B. B. Thayer, New York, and C. W. Merrill, San Francisco; for three years, T. H. Leggett, New York, and F. W. Denton, Painesdale, Mich. Directors, for one year (vote for two), W. L. Saunders, New York, E. V. d'Invilliers, Philadelphia, C. S. Robinson, Youngstown, Ohio, R. W. Brock, Ottawa, Canada; for two years (vote for two), H. L. Smyth, Watertown, Mass., Walter H. Wiley, Los Angeles, Calif., J. A. Holmes, Washington, D. C., J. J. Ormsbee, El Paso, Texas; for three years (vote for five), J. W. Finch, Denver, Colo., J. W. Richards, South Bethlehem, Penn., J. W. Malcolmson, Kansas City, Mo., H. V. Winchell, Minneapolis, Minn., Stanly A. Easton, Kellogg, Idaho, E. P. Mathewson, Anaconda, Mont., G. G. Crawford, Birmingham, Ala., L. D. Ricketts, Cananea, Mex. For directors, to fill the unexpired terms of Messrs. Rand, Stone and Kemp: R. W. Hunt, Chicago; James Gayley, New York; R. V. Norris, Wilkes-Barre, Penn. The periods of service for which candidates

are proposed above are the result of selection by lot. Members can change these at pleasure.

The following directors from the old board will fill their unexpired terms in the new board in accordance with the new constitution: Terms expire in 1914, James Douglas, J. F. Kemp, A. R. Ledoux; terms expire in 1915, E. B. Kirby, C. F. Rand and G. C. Stone.

The following vice-presidents of the council, whose terms expire in February, 1914, will hold over: Karl Eilers, Waldemar Lindgren and B. B. Thayer. The following councilors will also hold over: A. E. Carlton, W. J. Olcott and E. L. Young, terms expire February, 1914; John H. Janeway, Jr., Sidney J. Jennings and Joseph W. Richards, terms expire February, 1915.

On the adoption of the new constitution the council and officers thereof will cease to exist. The ballot is dated at New York, Jan. 6, 1913, and is signed by the nominating committee, Philip N. Moore, chairman.

A separate circular, signed by Charles Kirchhoff and Karl Eilers, proposes the name of Joseph Struthers for secretary of the council.

Copper Freight Rates

WASHINGTON CORRESPONDENCE

The recent ruling of the Interstate Commerce Commission on the rates on refined copper from the northern peninsula to Detroit, Mich., particularly from Houghton, Hancock, Lake Linden, and Dollar Bay, has been briefly noted in the JOURNAL, Jan. 14, 1913, p. 34. Below are more extended notes on the complaint and the commission's ruling.

The rate to Detroit from the Michigan peninsula has been 32½c., and from upper peninsula points to New York, Perth Amboy, Newark, Jersey City, N. J., Rome and Hastings-on-Hudson, N. Y., 35½c. per hundred.

The complainants in the case were the Michigan Copper & Brass Co. and the Detroit Copper & Brass Rolling mills, both situated at Detroit, Mich., manufacturers of copper and brass products, consisting of copper, brass and bronze sheets, rods, wire, tubes, bars and plates. The defendants were the Duluth, South Shore & Atlantic Ry., the Michigan Central, New York Central, New Haven, Pennsylvania and others.

The competitors of the complainants are situated largely at Bridgeport, Ansonia, Waterbury, Farmington and Torrington, Conn. About 60 or 70% of the total production of copper and brass in the United States is manufactured there. The remainder of the production is scattered between Buffalo, New York City, Perth Amboy, Pittsburgh and Detroit. The complainants in the case use every year approximately 40,000,000 lb. of refined copper. The total annual consumption at Detroit is over 53,000,000 lb., or approximately 1100 carloads. This copper comes to Detroit from upper peninsula, Montana, and Eastern refineries. Statements prepared by complainants show the following receipts of copper, in pounds:

	Western Copper from Montana Refineries and Tacoma		Copper from Upper Peninsula of Michigan Refineries		Eastern Copper from Eastern Refineries
Year	All Rail	Rail and Water	All Rail	Rail and Water	All Rail
1910.....	4,097,587	6,789,998	1,661,288	6,892,187	17,620,896
1911.....	5,702,791	7,113,007	2,872,945	10,648,837	14,632,776
1912 (up to June 1)..	10,409,491	110,186	3,356,723	3,503,494	1,736,655

The amount shipped to other consumers in Detroit is not shown by the record. The comparatively large shipment of all-rail copper from the upper peninsula during the first five months of 1912, is probably to be accounted for by the fact that the closed season of navigation on the Lakes, Dec. 1 to Mar. 31, comes at this time, during which period shipments of copper are made all-rail. The above table shows that during the 2½ years indicated the complainants received from upper peninsula and Western refineries, a total of 28,100,825 lb. of copper all-rail, and 35,057,000 lb. by rail and water. Their total all-rail shipments, including those from Eastern refineries, were 62,091,152 lb. From upper peninsula points alone, complainants' shipments, during these 2½ years, amounted to 7,890,956 lb. all-rail, and 21,044,518 by boat, a total movement of 28,935,474 pounds.

The complainants proved that they could not compete with the Eastern manufacturers, in that if they paid $17 per cwt. for Lake copper, f.o.b. upper-peninsula points; and freight at 32½c. per cwt., they were then at a disadvantage in shipping to an Eastern market over a manufacturer paying $17 per cwt. for his copper, plus 35½c. freight, in that the 3c. differential would nowhere nearly cover the differences between freight on finished product from Detroit to the seaboard, and Eastern factory to consumer. A corresponding argument applies to electrolytic-copper receipts.

It is therefore ordered by the commission that the defendants shall put in force a rate to Detroit on or before Mar. 1, 1913, which shall be at least 10c. less than their corresponding rates to New York and points taking New York rates, and that this 10c. differential shall be maintained for at least two years from the date it is put in force.

Nickel in 1912

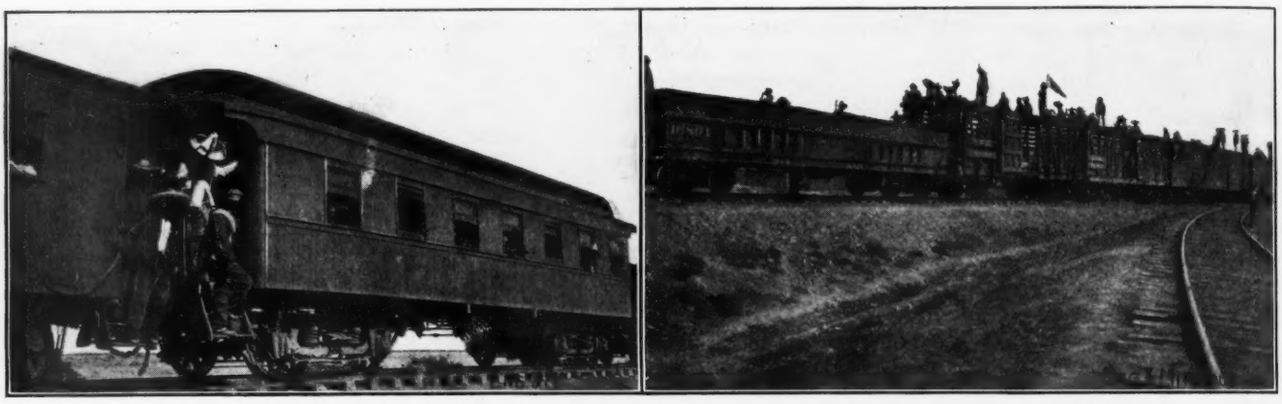
The production of nickel in the United States, except as a byproduct, is still confined to one company, the International Nickel Co., which imports nickel matte from Canada for further treatment; no nickel mining is carried on in the United States. The imports of nickel matte in 1911 amounted to 23,993 tons, containing 29,545,967 lb. of nickel, and the increase for 1912 should amount to about 1,000,000 lb. The production of electrolytic nickel is understood to have fallen off greatly during the year, as the International Nickel Co. is now marketing a large portion of its product as monel metal, the product of direct refining without separation of the copper.

As a byproduct, electrolytic nickel is being produced by the Baltimore Copper Smelting & Rolling Co.; by the Raritan Copper Works; is believed to be produced by the Maurer plant of the American Smelting & Refining Co.; while nickel sulphate is produced by the United States Metals Refining Co. The Raritan was the only new producer in 1912.

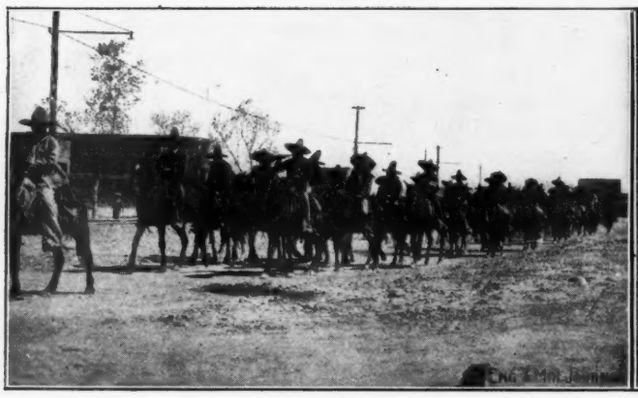
There were no fluctuations in price for the year, quotations ranging from 40@45c., according to quantity and quality, for metallic nickel.

The Risdon-Union 5-cu.ft. Dredge of the Boston & Idaho Gold Dredging Co., operating near Idaho City, Idaho, dug in November 99,950 cu.yd., the actual running time for the month being 82.6%. This is an extraordinary output, and, so far as we know, a record for a dredge having 5-cu.ft. buckets.

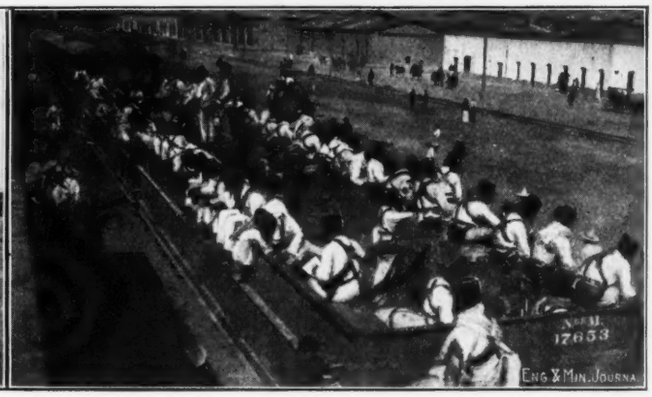
PHOTOGRAPHS FROM THE FIELD



PASSENGER AND FREIGHT TRAINS IN MEXICO GUARDED BY SOLDIERS



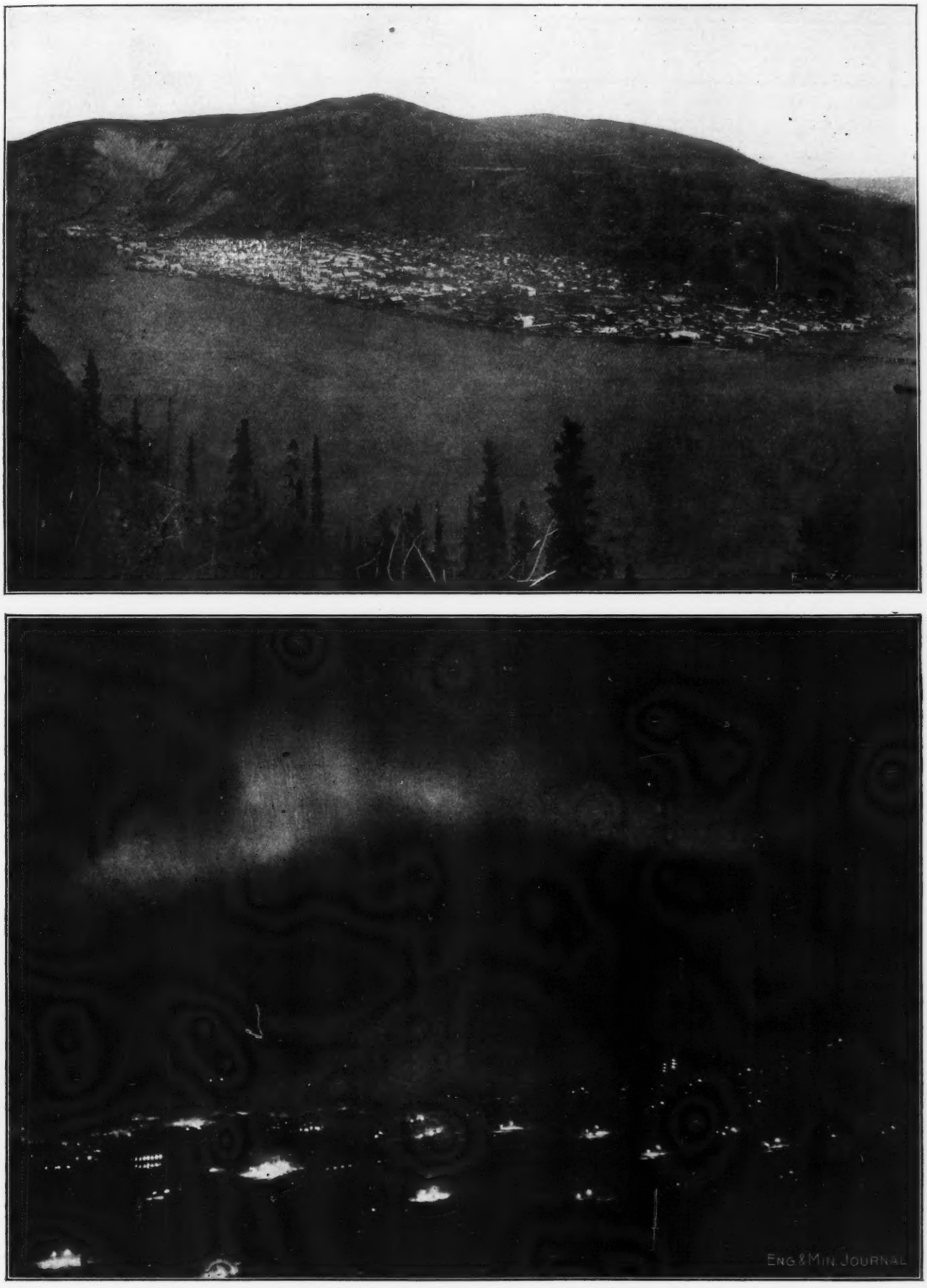
RURALES ON THE MARCH



MEXICAN TROOPS EN ROUTE

(A correspondent states that these photographs represent conditions in Coahuila and Durango, Mexico, as they were in December. All passenger and freight trains were guarded as shown.)

TWO FAMOUS GOLD MINES OF THE CRIPPLE CREEK DISTRICT, COLORADO



DAWSON, YUKON TERRITORY, BY DAY LIGHT AND BY THE LIGHT OF THE AURORA BOREALIS

PERSONALS

E. B. Kirby is in the City of Mexico.

James Gayley has been awarded the Perkin medal.

A. von der Ropp has returned from San Francisco.

P. B. McDonald, for the past year at Negaunee, Mich., is at Gouverneur, New York.

H. F. Lefevre has returned to New York from two months examination work in Panama.

Edwin J. Collins, has returned to Duluth from an examination trip to Alma, Colorado.

A. J. Wyly, after an absence in Australia, has returned to Lebong Tandai, Benkoelen, Sumatra.

F. G. Lasier, of Detroit, Mich., is in the Cripple Creek district in Colorado during January.

Hans C. Behr has retired as mechanical engineer for the Consolidated Gold Fields of South Africa.

F. F. Sharpless is in Nevada on professional business. He expects to return to New York about the end of January.

S. A. Moss, of San Francisco, president of the Calaveras Dredging Co., operating at Jenny Lind, Calif., is in New York.

Henry E. Wood is passing through Pittsburgh, New York and Boston, returning to Denver about the end of January.

John Parr has resigned as manager of the Pioneer Consolidated Mines Co., and is succeeded by Mr. Bandy, of San Francisco.

F. C. Dill, formerly assayer at the Helester mine is now chief chemist at the Pioneer consolidated mines near Towle, California.

Howland Bancroft is engaged in making examinations in Western Nevada and will return to Denver the latter part of January.

Stewart Barry and R. Russell Walker on Jan. 1 were admitted as partners in the metal firm of William Jacks & Co., London, England.

H. C. Hoover arrived from San Francisco on Jan. 9 and sailed for London on Jan. 11. He expects to return here in about two months.

R. B. Brinsmade has returned to his office in Pueblo, Mexico, after several weeks spent in examining mines in the northern part of the state.

M. P. O'Brien, of Chicago, is opening up the old Nonesuch copper mine in Ontonagon County, Mich. His address is at Ontonagon, Mich., for the present.

John D. Hubbard has returned to his home in Santa Clara, Calif., from a professional visit to the East in the interests of the Chosen Mining Co., at Seoul, Chosen.

George W. Thomson, general manager of the Porcupine Lake Gold Mines Co., Porcupine, Ont., has resigned and is going to London to take up another appointment.

J. H. Wolfe, of San Francisco, manager of the Defender Development Co., operating in Amador County, Calif., made a recent visit to New York on business connected with his company.

John P. Chadwick, lately with the Miami Copper Co. at Cananea, Sonora, Mexico, sails, on Jan. 18, from New Orleans to take the position of Chief Chemist with the Braden Copper Co. in Chile.

W. D. Pearce, of Los Angeles, Calif., has been in New York and has gone to Cusihuiriachic, Chihuahua, Mexico, in connection with some mining operations there in which he is interested.

W. W. Johnson, president of the Union Construction Co., San Francisco, who recently returned from Alaska tin-dredging field on Buck Creek, is in New York on business connected with Alaska dredge construction.

John M. Boutwell, consulting geologist for Phelps, Dodge & Co., has finished field work on the property of the Detroit Copper Co. at Morenci, Ari., and has returned to Santa Barbara, Calif., to prepare his report.

B. G. Slaughter, Jr., has been appointed mechanical superintendent for the Canadian Copper Co., at Copper Cliff, Ont. He will have charge of all mechanical equipment and power plants; also of new construction.

L. C. Trent, of the L. C. Trent Engineering Co., Los Angeles, recently visited San Francisco and made a contract for the installation of a 60-ton cyanide plant at the Gold Bank mine in Forbestown district, California.

Henry H. Armstead is in Guanajuato, Mexico, making an inspection of the properties of the Colmena Mining Co. and the Montana & Mexico Mining Co. From Guanajuato he will visit the properties of the Mexican United Co. in Tepic and Jalisco.

The new offices of Stephen T. Williams & Staff, Inc., are now located at the Hudson Terminal Building, 50 Church Street, New York. The newly elected officers are: President, F. W. LePorin, vice-president and chairman of the board, Stephen T. Williams, secretary and treasurer, C. W. Anderson. These gentlemen with H. Ralph Hendrickson, L. H. Hendricks and Robert Anderson, constitute the board of directors. Dr. Henry M. Payne, formerly their mining and metallurgical expert, now becomes chief of staff.

SOCIETIES

Kansas Engineering Society—The annual meeting will be held at Topeka, Kan., Jan. 21 and 22. T. J. Strickler, Topeka, Kan., is secretary.

Society of Chemical Industry, New York Section—The next meeting of the section will be held at Rumford Hall, 50 East 41st Street, on Jan. 24 8:15 p.m. The program for the evening will include the presentation of the Perkin Medal to James Gayley, the presentation address being made by Dr. Charles F. Chandler. An address on the Metallurgy of Steel will be made by Dr. Henry M. Howe; other addresses by Edward Hart and Dr. Rossiter W. Raymond.

American Iron & Steel Institute—The secretary of the Institute, James T. McCleary, announces the taking over of the statistical work of the American Iron & Steel Association, and states that the collection of the statistics has been placed in charge of William G. Gray at Philadelphia, continuing the offices at 261 South Fourth Street. All statistical communications are to be sent to this address. All communications except such as relate to statistics are to be addressed to Secretary McCleary at the office of the American Iron & Steel Institute, 30 Church Street, New York. In the final issue of the "Bulletin" of the American Iron & Steel Association, Dated Dec. 31, 1912, the retiring general manager, James M. Swank, has an article making reference to the various presidents of the association in the 40 years covered by his administration—Samuel J. Reeves, Daniel J. Morrell, B. F. Jones and Joseph Wharton—also to those who were Mr. Swank's principal assistants at various times. This issue of the "Bulletin" is spoken of as the last of its kind, and it is stated that the publication which will take its place will be in magazine form and will make its first appearance in New York late in January.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

COPPER—Process for the Treatment of Ores. Joseph Irving, Salt Lake City, Utah. (U. S. No. 1,048,541; Dec. 31, 1912.)

ORE FEED-MIXER and Distributer. Louis T. Sicka, Tooele, Utah. (U. S. No. 1,047,316; Dec. 17, 1912.)

CYANIDING—Apparatus for Atomizing Metals. J. M. Neil, New York. (U. S. No. 1,049,314; Dec. 31, 1912.)

CYANIDING—Apparatus for Precipitating Value-bearing Solutions. Whitman Symmes, Virginia City, and Walter E. Trent, Reno, Nev. (U. S. No. 1,048,373; Dec. 24, 1912.)

STAMP MILLING—Improvements in Pneumatic Percussive Apparatus such as Ore Stamps and the Like. Fraser & Chalmers, Ltd., London, Eng., and H. C. Behr, Johannesburg, Transvaal. (Brit. No. 22,083 of 1911.)

RADIUM—Process of Treating Complex Radium Ores. Sidney Radcliff, Bairnsdale, Victoria, Australia. (U. S. No. 1,049,145; Dec. 31, 1912.)

ZINC-FURNACE—George Londress and Webster Worley, Grafton, W. Va. (U. S. No. 1,048,420; Dec. 24, 1912.)

PHOSPHATES—Process of Producing Phosphorus from Mineral Phosphates. Frank S. Washburn, Nashville, Tenn. (U. S. No. 1,047,864; Dec. 17, 1912.)

PYRITES—Improved Metallurgical Treatment of Pyrites and Other Iron Sulphides. L. T. Wright, San Francisco, Calif. (Brit. No. 26,128 of 1911.)

SEPARATOR—Ore Separator. Malcom P. Bates and John S. Lampton, Oceanpark, Calif. (U. S. No. 1,048,026; Dec. 24, 1912.)

CINDER CAR for Molten Metal and Liquid Cinder. Louis F. Kuhn, Cananea, Mexico. (U. S. No. 1,047,659; Dec. 17, 1912.)

ELECTRIC FURNACE—Metallurgical Furnace. Charles H. Fulton and William A. Coursen, Rapid City, S. D. (U. S. No. 1,048,144; Dec. 24, 1912.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Jan. 8

The Inventor of the Thiogen Process, Dr. Stewart W. Young, is studying the cause of the excessive accumulation of black smoke, or lampblack, in the smokestack of the experimental thiogen flue in operation at the smeltery of the Penn Mining Co. at Campo Seco. Improved mechanical devices have been added to the flue that was built in April, 1912, and the practical results of the experiments have been wholly satisfactory with one exception. The process has proved successful in taking the sulphur dioxide from the McDougal roaster and reducing it to sulphur vapor; but when the sulphur dioxide is broken up by contact with the oil gas and plaster-of-paris fragments, provided for that purpose, the sulphur vapor hangs to the soot accumulation, and the combination of sulphur and soot mixed with the oil forms a mechanical compound of lampblack. The cause of the accumulation of lampblack could not be determined by the operation of the experimental flue alone. Various causes have been considered. The tests will be made in a laboratory glassware furnace built for the purpose by the Thiogen company. Analyses of various crude and treated petroleums will be made and the methods of oil burning and gas production will be studied. When the farmers in the vicinity of Campo Seco come to understand the difficulties encountered and the persistent effort being made by the inventor and the smelters to perfect the process, it is believed that they will display some evidence of appreciation and withhold their complaints. In most instances of complaints against the smelters the farmers seem to have been satisfied only with frequent payment of damages or the permanent closing of the smelteries.

The Tailing Plant of the South Eureka Mining Co., was put into operation about the middle of December. This plant, handling the tailing from the 80-stamp mill, consists of 900 ft. of flume, 900 ft. of sewer pipe, a tunnel 161 ft. long, under the public highway and an open ditch 1800 ft. long. The sewer pipe is 12 in. diameter, with cemented joints. The tunnel is timbered. The bottom of the ditch was filled in with greenstone slabs along the sides and the floor made of concrete. The sides were made of wood and the space between the sides and the greenstone slabs filled with gravel. This was covered with 2-in. plank. The ditch is laid out on a 2% grade. The plant takes the tailing direct from the mill into a dry ravine that parallels and finally empties into Sutter Creek five miles below the town of that name. There are 10 or more places along the line of this ravine where tailing may be impounded behind a small dam. The storage capacity, measured by the present mill capacity, is equal to the tailing output of 50 years, without any expense for dam construction. The South Eureka is one of the mines against which an injunction was sought in November by farmers in the adjoining county of Sacramento because of alleged damage to farm land by the flow of the tailings from the several mills into the streams that have their source to the east of the Mother Lode mines and pass through the adjacent farm lands in the Sacramento valley.

The California State Mining Bureau has just issued Bull. 64, "Mineral Production in 1911," by E. S. Boalich, statistician. The bulletin contains 48 pages covering the amount and value of mineral production in 1911 and a comparison with 1910, the total production by counties, the total gold production in the history of mining in the state, the total petroleum production and cement production, and the itemized production by minerals in 1911. There are two features of particular interest and improvement upon similar bulletins issued by the bureau in the past. It is of standard size, 6x9 in., corresponding with the special bulletins, and contains a brief resumé of the several substances produced, naming the counties producing such substances, and forming a concise history of the mineral resources of the state. Of the 58 counties 55 are shown to have produced some form of mineral substance in the year, and there were 41 of such substances. The bulletin contains also a complete list of all publications issued by the bureau, and specially indicating those out of print. Of the 13 general reports only one is in print, and only 16 of the 64 bulletins. The demand for these publications is shown by the fact that of a total of 77 bulletins and reports 60 are out of print. The delay in publishing Bull. 64 is due to the lack of funds, and while the publication is valuable as a book of reference, it lost much of its value to the mining industry by the delay. There is a prospect that the legislature, now in session, will disregard the recommendation of the board of control that the appropriation for the State Mining Bureau be reduced to $40,000 for the two fiscal years beginning in July 1913, and allow the bureau sufficient funds not only to do its work promptly but expend it to meet the demands of the industry.

DENVER—Jan. 11

That the Consolidated Gold Fields of South Africa, Ltd., proposed a merger of the larger mining companies and reduction plants in the Cripple Creek district, and in which the Florence & Cripple Creek and the Midland Terminal railroads are included, is a current rumor in both Colorado Springs and Denver. The railroads are owned or leased by the Cripple Creek Central, a holding company, of which Henry M. Blackmer, of Denver, is president. This is the syndicate to which President John T. Milliken, of the Golden Cycle Mining Co., expected to sell his properties in this state about a year ago and ever since Milliken's negotiations, the syndicate has held an option on the Golden Cycle for about $6,000,000. The option is still valid and has been extended until Mar. 1, 1914, so as to give the syndicate time to negotiate for other properties. The same syndicate has an option on the Cripple Creek district property of the Stratton estate and 500,000 shares of stock in the Portland company which the estate owns, and if the negotiations go through the Stratton holdings will undoubtedly be included in the proposed merger of the El Paso, Vindicator, Golden Cycle and several other mining companies, in addition to the railroads and the Golden Cycle reduction plant and United States Reduction & Refining Co. plant at Florence. It is stated that the Mary McKinney and C. K. & N. have declined to go into the merger, but that the Henry Adney and the Kalinka will consider the offer. The El Paso is the nucleus of the merger. Allen L. Burris, president of the El Paso is now in New York in connection with the deal, as is also Mr. Blackmer.

[No official corroboration of this report can be obtained at the Consolidated Gold Fields' New York office.—Editor.]

The Outlook for Zinc Production in the San Juan district is bright. The Sunnyside mine in San Juan County operates a stamp mill concentrating the tailing from amalgamation tables. The concentrates contain, besides gold, silver, lead and copper, from 22% to 25% of zinc, which caused a penalty of about $6 per ton to be levied by the smelter. The practice of separating the zinc was adopted some time ago, thereby doing away with the penalty, the zinc product being sold for $10 or $12 per ton. A custom mill at Ouray follows the same practice, which means an additional profit of more than $50,000 per annum for one local mine, to say nothing of other local mines patronizing the mill. The North Star mill at Silverton has been remodeled as a custom mill for the treatment of zinc ores for that district and has ore enough in sight to run at full capacity, 800 tons per day, for several years. It is said that Edward C. Wallace is to be in charge.

The Isabella Mine has ample ore blocked out, it is said, to permit the present production of 75 cars per month for the next year and a half. A semi-official announcement that the company is on a sound financial basis and that it has paid off the debt incurred when the present administration took charge of the mine for the installation of new machinery as well as the sinking of the shaft, has been the cause of this stock becoming active on the Colorado Springs exchange and among local traders. Believing that there is plenty of ore in sight and that the veins are rich at depth, Eastern men who had interested foreigners in this district have attempted to get an option on the majority of the stock, and they have offered a good price for large blocks. It is said that the new ore opened on the 1200-ft. level is better than anything opened before in this mine.

SALT LAKE CITY—Jan. 10

The East Tintic Decision as made by the Department of the Interior, and requiring for patent a vein or lode in place possessing in itself a present or prospective value for mining purposes, and its bearing upon prospecting and the opening up of new properties has aroused much discussion in this state. An amendment to the mining law, leaving in

statu quo the question as to what constitutes a valid discovery, suggested by the Secretary of the Interior offers a new point of departure. According to such an amendment, possessory rights prior to discovery would be given for prospecting within a limited area for a term of years, the prospector being required to perform a reasonable amount of work during the life of the permit. Patent would follow, if discovery were made during the time given.

A New Power Company is being formed by a number of power companies in this and neighboring states, which will be capitalized at $40,000,000. The consolidation comprises a number of hydro-electric and steam-power plants, and will supply railroads, mines, mills, smelteries, etc., with power. The Utah Copper Co. is understood to be closely connected with the merger.

The Lead Smeltery of the International Company, at Tooele, is treating 500 tons of ore daily. Two furnaces are in operation, and it is expected that the two additional lead stacks in construction will be placed in commission during February. William Wraith, for a number of years superintendent of the Washoe reduction works at Anaconda, has been made general manager.

November Shipments from Tintic averaged 209 cars weekly, and are about 30% in excess of those for the corresponding month of 1911. The shipments show an increase over both October and September, the latter month being the largest for the first nine months of the present year. In the Beck Tunnel connections between the Humbug orebody and the 175-ft. level have been made, allowing an average weekly output of 3½ cars as compared to two cars in October. The Yankee is opening its zinc ores, and has raised shipments from one car weekly to more than two. The Dragon Consolidated made steady shipments of iron ore, and sent out shipments of copper ore, raising its weekly average from 10 to 16 cars. The May Day produced six cars per week as compared to four. The Gold Chain increased its weekly production to 12 cars as compared to between eight and nine cars, and opened new ore via the 1500 level of the Lower Mammoth. The Mammoth raised its output from 14½ to 20 cars, and the Iron Blossom increased shipments from 17 to 25 cars weekly.

NEGAUNEE—Jan. 10

The Increase in the Lake Rate for Iron Ore, of 5c. per ton, from the head of Lake Superior to lower lake ports, over the 1912 rate of 40c. per ton, recalls the conditions of a few years ago when the rate from Duluth, Superior, Two Harbors and Ashland was 75c. per ton. In 1907, when this rate prevailed, the rate from Marquette was 70c., and from Escanaba 60c. The 1913 rate from these two ports will be 30c. for each. It is thus evident that in spite of the small increase over 1912, the 1913 rates are reasonable compared to those of half a dozen years ago.

The Iron River Branch of the Chicago, Milwaukee & St. Paul Ry., it has been definitely announced, will be extended as far as the village of Iron River, contrary to rumors that it would stop construction at the Dober mine at Stambaugh. A site for a station has been secured near the Sheridan mine.

The Michigan State Tax Commission is making plans for systematic and efficient maintenance of records of orebodies as to size and value, for the purpose of taxation. The value of a mine is constantly changing, due to new finds, ore removed, fluctuations in market price of the product, etc.; also undeveloped mineral lands are gradually being explored and their values determined. It is desired to have a geologist or staff of mining geologists working constantly to keep all records to date, rather than that the information shall be left to be collected in a few weeks' hurried sitting of the tax commission. In this connection it is observed that the reports and maps of the state geologist have been found useful, and it has now been proposed to enlarge the duties of the geological department to include the collecting and keeping of such statistics.

JUNEAU, ALASKA—Dec. 23

Reports from the Porcupine District are most encouraging. Development work done this season has proved satisfactory and has given encouragement for further work. The Porcupine Co. has closed down for the season. This company has a large tract of ground and expects to be able to continue piping gravel into the sluices for 30 years. The placer ground controlled by Senator Dick and associates is said to be thoroughly prospected and it is reported that mining will be started on Glacier Creek next season. Timothy Vogel and associates, of the Calhoun Mining Co., will increase the force and operate on a larger scale than heretofore. The Burnham-Kennedy-Conway group of copper properties and the Three Guardsmen have been placed under bond to Col. J. H. Conrad, who is representing Canadians.

COBALT—Jan. 11

Despite the Falling off in Production, in 1912, amounting to 1,000,000 oz., Cobalt mining companies received approximately $2,000,000 more for their output and paid out in dividends, $1,273,863 more than in 1911. To date, Cobalt has produced silver to the value of about $81,000,000, half of which has been paid out as dividends. The production for 1912 is estimated at 30,500,000 oz. having a gross value of $18,605,000. The total estimated value of the ore reserves for all the mines in the camp is $30,000,000. One of the principal features of the year has been the great interest taken in Cobalt mines by English investors. English capital now controls both the Cobalt Townsite and the Casey-Cobalt, the former having paid $400,000 in dividends within the year.

PORCUPINE—Jan. 11

The Test Cases Under the Lemieux Act, arising out of the Porcupine strike, came up before the magistrate, Jan. 6. Peter Cleary and D. Holawaski, two of the strike leaders, were charged with violation of the act in participating in a strike without giving due notice. Judgment has been reserved until Jan. 14. In addition to these two cases, one of similar nature was entered against James Croft, a Hollinger man. All the other cases, of which there are more than 100, were held over until Jan. 14.

Unofficial Figures for the Gold Production from Porcupine for the year, 1912, are placed at $1,800,000. The Dome is credited with $700,000, the Hollinger, $900,000 and the Vipond and McIntyre $300,000 between them. Practically the whole of this production has been during the last six months. These figures must not be taken as a criterion for what may be expected during the coming year. The Hollinger, with 40 stamps running, will show an increase and with the proposed addition to the mill at the Dome, the production should be about double. This latter increase, however, will not be noticeable during 1913 as a certain amount of exploration work will have to be undertaken before the addition is actually decided upon and it will then take considerable time to build the mill. There will, however, be a number of small mills working throughout the camp which will have an important effect on the total production.

CHIHUAHUA—Jan. 10

The Cusihuiriachic Mining District, about 90 miles south of the City of Chihuahua on a recently completed branch railroad from the Orient line at San Antonio, again promises to become one of the important mining camps of Mexico. The Promontorio mine, owned by the Cusi Mining Co., of Chicago, the Potter Palmer interests and J. D. Hubbard largely in control, has produced since 1910, several million dollars worth of high-grade silver ore, some of which has run upward of 500 oz. of silver per ton in car lots. The output has been as high as $300,000 per month during part of 1912. Operations are now suspended owing to difficulties in shipping, but development is being carried on. The Cusi Consolidated Mines Co., C. L. Graves, president, and W. D. Pearce, manager, has extensive holdings in the district surrounding the Promontorio, in fact the locations of this company, which were among the first to be made in the district after its reawakening, were supposed to include the Promontorio ground. The Cusi-Mexicana Co. is shipping. This is owned by D. B. Gillies, H. C. Ferris and Hiram Smith. The Soledad, owned by Pascual Orozco, the insurrecto leader, recently shipped its first car, which averaged 2000 oz. silver per ton. Other shippers are the San Juan, Murray Crossette, manager, and the Esquadera. Revolutionary disturbances have seriously interfered with the development of this camp, but the results which have been accomplished since 1910 have certainly given to "Cusi," as it is locally and generally called, a place on the mining map of modern Mexico.

The Late Activities of Rebel Bands on the northern division of the Mexico Northwestern Ry. between Madera and El Paso has also worked a severe hardship on most mining companies by delaying the delivery of fuel, machinery and supplies, and if relief is not soon afforded it is likely that operations may be in many instances stopped. The activities of the robber bands is also increasing in the vicinity of Parral and Santa Barbara. It is only a few weeks since the Los Azules camp of the El Rayo Mining & Development Co. was visited by a band of 100 or more bandits who had planned their visit so as to intercept and secure the payroll of several thousand dollars; they failed in this, but did compel the manager, J. S. Colbath, to pay 1000 pesos for his liberty. At about the same time an unsuccessful attempt was made to rob the American Smelting & Refining Co. at Minas Nuevas of its payroll. In the state of Durango bordering on Chihuahua, the bandits are displaying similar boldness in their operations, and in most instances foreigners, particularly American. companies and individuals are the sufferers.

THE MINING NEWS

ALASKA

O. P. GAUSTAD OF CLEARY is contemplating the installation of a hydro-electric plant near the mouth of Pilot Creek, for the purpose of supplying quartz properties with power.

ALASKA-MEXICAN—During November 1912, 18,564 tons of ore was treated from which $37,368 was recovered in bullion and concentrate, or $2.03 per ton, at a net profit of $11,922.

ALASKA UNITED—During November, 17,542 tons of ore was treated in the Ready Bullion mill from which $49,906 or $2.87 per ton was recovered as bullion and concentrate; the net profit was $26,091. In the 700-Ft. Claim mill, 19,231 tons of ore was treated, from which $39,302 or $2.06 per ton was recovered, the net profit being $14,660.

MANSFIELD—This company is planning to do considerable development work in the spring at its property near Juneau. A crew is now at work repairing flumes and sluice boxes.

BREWER-ALASKA SYNDICATE—The stamp mill for this property at Mile 7 has arrived, and will be erected at once. Operations will be carried on throughout the winter.

YUKON GOLD CO.—Reports from Iditarod state that this company will exercise its option on the Mohawk association claim on the lower end of Flat Creek. A thorough testing of the ground by Keystone drill has revealed the presence of a pay streak 600 ft. wide.

PENNSYLVANIA—On this Wolf Creek claim a station has been cut at the 140-ft. level. The vein has narrowed somewhat at depth, but the owners expect by drifting to encounter the extension of the rich orebody developed nearer the surface.

NEWSBOY—A cleanup made after a run of a little less than five days yielded amalgam worth $5000. The ore was taken from the rich orebody which was passed through by the shaft below the 115-ft. level, but which has not been found to extend to the 215-ft. level. Owing to a shortage of ore, the mill is being operated but one shift.

PIONEER—Ore bins have been built at this mine, on the divide between Fairbanks and Cleary Creeks. A contract has been let to sink the shaft 100 ft. from the 85-ft. level and to do 200 ft. of drifting at 185 ft.

IRON MASK—This claim, adjoining the Pioneer, is under lease to Alois Friedriechs, who is sinking a working shaft.

AMERICAN EAGLE—This property is in litigation between William McDonough and associates, and Frederick Fey. At the trial recently held at Fairbanks, the jury failed to reach a verdict. A vein showing 3 ft. of ore assaying about $40 has been opened on the surface. At the bottom of the 40-ft. shaft the vein has a width of 14 in. with about the same grade of ore. Albert Berry is reported to have located the extension of the vein on the right limit of Fairbanks Creek.

ARIZONA

Maricopa County

BOWMAN AND MURPHY, who made a discovery of cinnabar in the Mazatzal mountains in the eastern end of the county, have bonded their claims to C. N. Sears and associates. Work is to be started within 90 days. Some native quicksilver has been found with the cinnabar.

W. E. BANCROFT has found a good grade of carbonate ore on his group of claims near Eagle Eye. The property is about 30 miles west of Wickenburg and the nearest railroad station is Aguila on the Arizona & California Railroad.

THE RICHARDSON & FISKE property near the old Rackensack mine has recently been bonded by Los Angeles men. There is a small mill on the property and some good ore has been produced. Active development work will be started at an early date.

RED ROVER—From this mine north of Phoenix another carload of ore was recently shipped to the smelter at Douglas.

TELLURIUM MINING CO—This company has bonded its claims to Col. Frederick Bowler. There are 14 claims in this group in the northeast corner of the county. Time is allowed for reëxamination and sampling, and if this confirms the result of the first examination, active development work will be started.

Mohave County

A DREDGING COMPANY is, according to reports, being formed in the East by M. W. Musgrove, of Kingman, for the purpose of operating a dredge in the Colorado River near the mouth of the Grand cañon. There is a considerable area of gold-bearing sand and gravel bars along the river north of Kingman.

LELAND-MITCHELL—The installation of the machinery for power and lighting has been completed. The main shaft on the Mitchell has reached a depth of 400 ft. It is the intention of S. R. Porter, the manager of the company operating this property, to sink it to a depth of 750 ft. and then, to crosscut several veins outcropping on the claim.

AMERICAN METALS MINES CO.—At this property at Deluge Wash, it is reported that a large shoot of zinc ore has been discovered in the shaft. The sinking of the shaft is being continued to the 100-ft. level. The company is making arrangements to equip the property with a hoist.

TENNESSEE—The main shaft has reached a depth of 900 ft., at which level sinking will be suspended for the present, and a crosscut will probably be driven to the main orebody. It is reported that on the 700-ft. level the ore shoot is of higher grade than on the higher levels and that stoping will be concentrated upon this level.

PINKHAM—The shaft is being sunk at the rate of 90 ft. per month. The shaft, recently started, is near the southeastern end of the claim and will probably be connected with the other shaft by a drift when the desired depth has been reached.

CALIFORNIA

Amador County

LINCOLN CONSOLIDATED—The directors have decided to install a new pump of sufficient capacity to take care of the water that recently came into the drift on the 1950-ft. level, supposedly from the Wildman. It has been found impossible to keep the water down with the Lincoln pump.

SOUTH SPRING HILL—The stamp mill at this mine at Amador City was destroyed by fire on Dec. 15. The mine and mill had been idle for several years. John R. Tregloan, of Alameda is agent for the Boston owners.

MEMPHIS—A steam hoist has been installed at this mine between Drytown and Plymouth. Monteverde and Sciaroni are the owners.

ALPINE—The reopening of this mine at Plymouth is reported to be in progress.

KENNEDY—The east vertical shaft has cut the vein at a depth of 3716 ft., disclosing ore 14 ft. wide of good milling grade. The deepening of the shaft from the 3450-ft. level, recently begun, was in pursuance of the policy adopted at the time of the installation of the hoist about 12 years ago. The equipment was designed on the theory, based on surveys and other engineering data, that the dip of the main vein would be constant and that the position of the shaft would practically insure the encountering of the vein at a depth not to exceed 4000 ft. Since the deepening of the shaft was begun it became reasonably clear that the vein would be found at a point well within the depth named in the early engineering calculations, and it was the purpose to cut a station at the 3700-ft. level. It is now understood that the shaft will be deepened another 100 ft., or to the 3800-ft. level and into the hard foot wall, as the point of intersection shows a gouge and some soft vein matter unsuitable for making a station. The grade of the ore is said to equal that in the lower working levels. Webb Smith, of Jackson is superintendent.

Butte County

NIMSHEW RIDGE GOLD MINING CO.—The gravel in this mine near Nimshew has been opened for a width of 45 ft. The cleanups are paying the cost of development. About 600 ft. of new pipe will be installed.

UNITED STATES DIAMOND CO.—A diamond recently found in this mine at Cherokee is reported to be on exhibition at Oroville, and weighs more than half a carat.

Calaveras County

GOLD HILL—A 30-ft. vein of rich quartz has been disclosed in the tunnel of this mine at Bear Mountain. The quartz is said to be unlike any other formation in the county. It is soft enough to yield to panning. The walls are black slate. The installation of a 5-stamp mill is contemplated. Voinich Bros., are owners.

MORGAN—J. B. Russel, of San Francisco, representing the Fair estate, and W. A. Boyd, mining engineer, have made an examination of the mine at Carson Hill and are reported to be preparing to reopen the property.

WATERMAN—The third 5-in. test bore has reached a depth of 210 ft. on the main vein. The second bore was sunk to 420 ft. An assay office and core house have been built. H. A. Kuns, of Angels is superintendent.

Inyo County

OLD GLORY—The 5-stamp mill at the Dean & Jones mine will be moved to the Old Glory in the Slate range near Tank station. L. L. French is owner.

AURORA CONSOLIDATED MINING CO.—This is a new company capitalized at $1,000,000, organized to operate the Aurora mines. The majority stockholders are residents of Provo, Utah. J. H. Miller, of Hawthorne, and C. E. Knox, of Tonopah, are interested. The ore is low grade and tests are to be made to ascertain the best method of treatment.

LUCKY JIM—This mine near Darwin is shipping 10 tons of ore of good grade per day. Charles W. Collins and others are owners.

Tuolumne County

PROVIDENCE—The mill has been overhauled and a new water-power hoist installed. The stopes have been opened and ore blocked out. The mill will start as soon as there is water. The mine is near Tuolumne.

DREISAM—A second oreshoot has been cut in the crosscut on the 500-ft. level about 12 ft. from the first strike of a week previous.

LOUISIANA—A good streak of ore was cut in the incline shaft at this mine near Tuolumne.

COLORADO

Clear Creek County

COLORADO CENTRAL—This property will be reopened and developed. A survey for a new tramway has been made from the mine to a place near the Pelican mill at Silver Plume. The company now in control of the property contemplates the erection of a new mill designed to treat the ore from the Colorado Central, Dives-Pelican and Seven-Thirty mines.

KELLY TUNNEL—It is reported that a development company is being organized to take over the Kelly, New Boston and Mineral Chief properties, and that the crosscut tunnel which is now 2800 ft. long will be extended to explore the many promising veins owned by this company.

HONEST JOHN—This company will soon resume development. Bids are now being received covering the extension of the main crosscut tunnel. It is stated that ample funds are available to cover the cost of a systematic campaign of development. H. G. Fowler is manager.

EAST GRIFFITH—Development has been resumed at this property, after five years of idleness. The company contemplates the remodeling of the 25-ton concentrator and anticipates early resumption of production. F. A. Maxwell, of Georgetown, is manager.

CAPITAL—The main crosscut tunnel is being advanced; it is now 5700 ft. long. Additional development will be begun in the near future.

SANTIAGO—This property is shipping two carloads of ore per week to the smeltery at Salida. The company anticipates an early resumption of active development and increased production. Mr. Rogers is manager.

BIG INDIAN—This property is being developed by a small force of men under the direction of E. J. Butts, of Georgetown.

STANLEY—During December the fifth-level west heading was advanced 89 ft. to a total length of 1788 ft. The vein is 2½-ft. wide. Crosscut No. 503 north was advanced six feet.

TENNESSEE—This company is developing a group of claims in Chicago Creek. The crosscut tunnel, which is now 815 ft. long, is 5x8 ft. and is being advanced 4 ft. per day. C. S. Birkins is manager.

Gilpin County

PEWABIC—This Central City company has filed a petition in voluntary bankruptcy, with assets $515,130 and liabilities $593,282. The assets consist of mining property, mills and machinery in Gilpin County.

Lake County—Leadville

CURRAN—Excellent iron ore has been opened in this shaft on Carbonate Hill, which assays 34 oz. of silver per ton with an excess of iron. Several cars per week are being sent to the smelter.

DINERO TUNNEL—This company on Sugar Loaf, is shipping steadily 200 tons per month of a good grade of ore. Development work is being kept well ahead.

San Juan Region

BARSTOW—This company is preparing for extensive development work this winter. A raise will be started from tunnel No. 1 for the purpose of opening up new orebodies. At the same time, the shaft will be sunk a few hundred feet. It is possible that the raise will be carried as high as 900 ft. Four carloads of lumber were shipped from Silverton to be used for timbering the raise. About 30 men are now employed.

MOUNTAIN TOP—The machinery for this mine and also for the Old Humboldt was received at the mine this week and stores and provisions are laid in for six months. These properties lie between the Camp Bird, Smuggler Union and Revenue.

Teller County—Cripple Creek

DIVIDENDS WERE PAID BY 20 Cripple Creek mining companies in 1912, as compared to 18 in 1911, and of the 1912 dividends but one resulted from a sale of property. While it is impossible to secure the exact profits of the lessees, and close corporations, these amounts have been estimated, and make the total $2,503,548.

ABE LINCOLN—Some specimen ore has been opened on the fourth level of this mine by sublessees, Parker and Greenfield.

AMERICAN EAGLES—Especially rich ore has been opened on the 15th level.

GRANITE—The water is receding rapidly in the main shaft, and it is only a matter of a few weeks until work can be started in the 12th or bottom level of the Coin shaft. As the water goes down, the shaft will be sunk.

C. K. & N.—Within the next few days this mine will be shipping a good grade of ore from its own ground, on the 10th level, where a rich shoot has been opened, and has been mined up to the side line by the El Paso company.

STRATTON'S INDEPENDENCE LTD.—In November, 3438 tons of $9 ore was produced; 10,600 tons of low-grade mine, and dump ore was milled, the net profit being $11,687.

IDAHO

Bonner County

ITASKA MINING CO.—This company has been organized to develop a group of five gold claims in the Pend Oreille mining district on Trestle Creek. The officers are Senator R. A. Hutchinson, president, Albert Harper, vice-president, John McChesney, treasurer, T. J. Johnson, secretary. The officers with W. R. Kelsey comprise the board of trustees. Capitalization $1,500,000.

Idaho County

DEEP SNOWS IN THE BUFFALO HUMP district have compelled some of the companies to reduce their operations on account of a shortage of provisions. Deliveries cannot be made before early spring.

AMERICAN EAGLE—The new two-compartment shaft has reached the 50-ft. level. The first station will be cut at, and laterals driven from the 100-ft. level.

MINERAL ZONE—The shaft is 200 ft. deep, and good ore is reported in the drifts.

DEL RIO EXTENSION—Work has been resumed on this property in the Elk City district.

MOTHER LODE—Preparations are being made by the lessees to ship ore to the Elk City reduction works. A considerable amount of good ore is reported as being opened.

CROWN POINT—Recent developments have opened some large bodies of mill ore and the management is trying to arrange to have it treated in the Mascot mill near by.

Shoshone County

INTERSTATE-CALLAHAN—Construction work is being hastened on the new 200-ton concentrator which will be ready to operate about Apr. 1.

LUCKY CALUMET—Both copper and lead are reported from the east of the deep tunnel.

TAMARACK & CUSTER—The first ore has been delivered to the Rex mill which has recently been overhauled to handle the Tamarack & Custer ores.

NABOB—The company has taken a option of 16 adjoining claims with a view to developing them in conjunction with their own properties in the Pine Creek district.

YANKEE BOY—A carload of ore was shipped recently which assayed 200 oz. of silver per ton in addition to the lead.

GOLD HUNTER—A 3-ft. vein of clean galena has been opened for a length of 200 ft.

TYLER—To do away with the long haul from the Tyler tunnel to Wardner an aërial tramway is to be built.

BLACK BEAR—Operations have been resumed on this property, the first work being the continuation of the raise from the No. 1 level.

ALICE—Unwatering of the 600-ft. level has been begun and as soon as completed development will be continued.

KING—Two carloads of antimony ore have been taken out for shipment and are awaiting the completion of the railroad spur.

NATIONAL—A width of 100 ft. has been proved in the copper strike on the 1700-ft. level.

AMY & MATCHLESS—Development contracts aggregating $25,000 have been let.

MICHIGAN

Iron

MORO—At this hard-ore mine at Ishpeming, which was abandoned several months ago due to exhaustion of the ore deposits, the pillars are being robbed and the ore trammed underground a half mile to the Cliffs Shaft on the opposite side of the city. Electric haulage at the Cliffs shaft was only recently installed.

NEWPORT MINING CO.—This company established a safety and efficiency department, Jan. 1, 1913. This is a new departure for the Gogebic range, although on the Marquette range the Cleveland-Cliffs Iron Co., Oliver Iron Mining Co. and Breitung-Kaufman companies maintain safety departments.

WARNER—At this mine at Amasa, a railroad siding was recently laid, and the operating company hopes to put the mine on the shipping list next season. Exploration has been conducted at this property for some time.

MANSFIELD—The lease of this mine in the Crystal Falls district expires in a few years, and the operators, the Oliver Iron Mining Co., will try to renew it. Although this mine has never been very profitable, it is the only mine in the district which has shipped Bessemer ore. It has been operated for several years.

OLIVER IRON MINING CO.—It is unofficially reported that this company's recent finds on Sec. 12 in the Crystal Falls district are of considerable importance, and may rival those of the Longyear company on Sec. 13, the famous "Mastodon find."

MISSOURI

Joplin District

KLONDIKE—This mine, formerly known as the Bull Moose, on a lease of the Charles W. Edwards "forty," northwest of Joplin is making a sensational showing. As much as a carload of high-grade concentrate is being taken from three hand jigs per week. Development work indicates a continuation of the rich ore and a widening of the orebody.

KIDD MINING CO.—This company, operating on the same land as the Klondike, is turning out a carload of blende weekly, which brings a premium of $3 or $4 because of its richness.

CAPITALISTA MINING CO.—This company, operating an old mill of small capacity near Belville, is making a good showing considering the equipment. Rich ore has recently been encountered.

SEVEN MINING CO.—This company, working on a sublease of the Capitalista, is producing as much as 30 tons of jack per week from two hand jigs.

SNAPP LAND—Coats & Ortt are opening a rich mine on the Snapp land at Thom's Station. Two shafts have been sunk, the south one at a depth of 135 ft. has penetrated the orebody about 4 ft. A drift is being driven east at the 172-ft. level of the north shaft. Drill records indicate a 40-ft. face of ore.

LULU V—A shaft sunk on this 50-acre lease near Spring City broke into ore at 171 ft., confirming the clippings from five drill holes. A good run of blende, lead and some calamine was encountered. A 14-ft. face is expected and a mill will be built in the spring.

NAPOLEON, AND EMMA A.—The mills at these mines at Thom's Station on the Nap Perry and Mexico-Joplin lands respectively are ready for operation. Efforts are being made to fill the sludge ponds of both places, sludge being hauled in to prevent seepage.

MONTANA

Butte District

WALTER M. YOUNG WAS KILLED Jan. 8 by a bursting pulley at the Peck concentrator, a small testing plant operated at the Washoe plant of the Anaconda Copper Mining Co., for the purpose of developing the centrifugal concentrator invented by P. F. Peck, for the treatment of slime; Mr. Young was superintendent of the plant.

PILOT-BUTTE—In sinking the shaft at this property the top of a rich shoot of copper and silver ore was recently encountered at a depth of 1610 ft.; 20 ft. below this point the shoot widened from 2 ft., to nearly six, carrying high-grade chalcocite and bornite, which assayed well in silver. The management has decided to continue sinking to the 2000-ft. level before crosscutting to the vein to determine the extent of the strike. The ore taken from the shaft has been stored for future shipment. Ore bins will be built on the Butte, Anaconda & Pacific tracks, passing over the Pilot claim.

BUTTE & SUPERIOR—The new hoist at this property is raising about 800 tons of ore per day for treatment in the mill, one section of which is kept running steadily. About six cars of concentrate, averaging nearly 50% zinc, are being shipped daily to the smeltery at Bartlesville, Okla. During the coming summer the management expects to prepare the Col. Sellers shaft for ore hoisting, and is contemplating the construction of an aërial tram 2000 ft. in length, for the transfer of this ore to the mill.

BUTTE-ALEX SCOTT—Orders have been given to sink the shaft at this property from the 1600, to the 2200-ft. level. Some good ore has been opened on the 1900-ft. level from the West Colusa mine, and it is for the purpose of more economically working this ore than by the raise formerly used, that it has been decided to continue sinking. Regular ore shipments are being made to the East Butte smeltery, and it is planned to increase the output shortly. N. F. Hugo, president of the company, recently made an inspection of the mine.

RAVEN—The shaft at this property has been sunk to the 1700-ft. level, and development crosscutting has been begun on the 1500- and 1700-ft. levels. As soon as a sufficient distance from the shaft has been attained, it is probable that sinking will be resumed to a depth of from 200 to 300 ft. lower. In the meantime mining in a small way has been going on between the 700- and 1300-ft. levels. During October smeltery returns of about $1100 were received; in November, $2600; and December up to Dec. 16, about $4400.

Broadwater County

OHIO-KEATING—At the recent annual meeting in Butte, J. E. Oppenheimer was elected president; J. S. Cohen, vice-president; C. S. Smith, secretary-treasurer; and these with B. E. Calkins, and W. M. Touhy will act as the board of directors. At the property, which is in the Radersburg district, the shaft is being sunk to the 500-ft. level where a station will be cut and an electric pump installed, after which crosscutting to the vein will be started. Mining is being done on the 100- and 300-ft. levels, and from six to eight cars of ore are shipped monthly to the Washoe smeltery at Anaconda.

Granite County

GRANITE-BIMETALLIC—As the result of successful experiments made on a cyanide process for the treatment of tailings from the Granite, and Bimetallic mines, a 500-ton mill has been built near the Bimetallic mill, near Philipsburg. As soon as the weather permits this mill will be started and operated on the tailings in the series of slum ponds which extend for several miles below the properties.

NEVADA

Nye County

Shipments in tons from Tonopah mines for the year to date and for the week ended Jan. 4, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3150	.....
Tonopah Belmont	3214	.....
Montana-Tonopah	814	.....
Tonopah Extension	900	.....
West End	1100	.....
Midway	....	.....
MacNamara	550	.....
North Star	45	.....
Mizpah Extension	....	.....
Jim Butler	300	.....
Tonopah Merger	215	.....
Totals	10,288	.....
Estimated value	$215,550	

MACNAMARA—What gives evidence of being an important new oreshoot has been opened on the 300-ft. level and is now 8 ft. wide, assaying from $20 to $25 per ton.

TONOPAH MERGER—Sinking of the shaft a further 100 ft. below the 1070-ft. level has been started.

TONOPAH BELMONT—The report for the quarter ended Nov. 30, 1912, states that the net income for that period was $532,955 and the company's cash reserve amounted to $1,063,287.

MONTANA-TONOPAH—Three new ore shoots have been cut and a new shoot of very rich ore has been opened in a stope on the 162-ft. level.

NEW GOLDEN CROWN—The main shaft of this property, between the Montana and Midway, mines has entered a vein of low-grade ore now more than 10 ft. wide.

WEST END—The shaft which is being sunk from the 600-ft. level is cutting unexpected stringers of rich ore.

TONOPAH EXTENSION—This company is opening on the 600-ft. level the downward extension of its big ore shoots on the level above.

JIM BUTLER—In this mine an oreshoot 7 ft. wide, assaying $30 per ton, has been opened on the fifth level for a length of 100 ft. and on the level below, and which has been proved on the level below for over 75 feet.

White Pine County

THE EXTREME COLD WEATHER for the last week, from zero to 23° below, has materially curtailed the production of ore from all the shipping mines. The water pipe line of the Nevada Consolidated, from Ward Mountain, is frozen, shutting off the water from the Nevada Consolidated, Giroux and Veteran mines. The supply to the Veteran has been frozen for 10 days.

NEW MEXICO

Socorro County

SOCORRO—The crusher is being moved to the shaft and a belt conveyor is being installed, leading direct to the bins at the mill, which will eliminate the elevated tramway in use several years. A large daily tonnage of ore is being handled.

MOGOLLON GOLD & COPPER CO.—About 40 tons of good ore is shipped daily to one of the custom mills, from the Little Charlie. The electric equipment recently installed is proving highly efficient and is an economic factor in the operation of the mine.

ERNESTINE—In the second 10-day cleanup in December 9600 oz. of gold and silver bullion were smelted; also 9600 pounds of high-grade concentrate; 955 tons of ore were milled during the period. Favorable mine developments are reported in the lower levels.

DEADWOOD—During the week ended Dec. 28, 321 tons of ore were milled yielding four bars of bullion and 58 sacks of concentrate. Mine development was advanced 25 feet.

OAKS CO.—During the week ended Dec. 28, 85 tons of ore was shipped from the Pacific mine to the custom mill. The face of the tunnel is 7 ft. wide, of a good milling grade. Shipments to the mill were also made from developments on the Johnson and F. A. mines.

OREGON

Baker County

UNDERWOOD—Some fine nuggets have recently been found on this placer property near Cornucopia.

Clackamas County

OGLE—Fairclough Brothers and associates of Oregon City will build a 100-ton cyanide mill on this property in the near future.

Josephine County

STEAM BEER—This old placer mine on Grave Creek, just above Leland has been sold by H. K. Miller to Ohio men, who will take immediate possession and operate the property on an extensive scale. Three giants will be put in operation at once. The recent rains have raised the creeks so that there is sufficient water. This mine is one of the best known of the producing properties in the county, and has been a dividend payer for many years.

WATTS—B. S. Watts, of Provolt, owner, states that he will commence the winter's run on this placer mine in Horse Head gulch, as the rains have commenced. This mine has been a producer since 1861 when it was first located by the elder Watts, who died a year ago.

Lane County

WEST COAST MINING & MILLING CO.—These mines in the Bohemia district will be shut down for a month for repairs at the mill. The 20 stamps, have been crushing rich ore. Bullion is shipped quite frequently.

VESUVIUS—It is reported that the manager, F. J. Hard, has the 10-stamp mill running at capacity and will keep it busy all winter.

SHANE GROUP—W. H. Shane, owner, is developing his property and will work all winter. He has built snow sheds at the portal of the tunnel and is comfortably situated. This property is near Bohemia.

SOUTH DAKOTA

Lawrence County

HOMESTAKE—A meeting will be held at San Francisco, Feb. 10, at which the recommendation of the board to increase the capital stock from $22,000,000 ($160,000 unissued) to $25,116,000, will be considered. The proposed increase would leave 32,760 shares unissued. Between June 1, 1905, and Nov. 1, 1912, the company spent $3,359,786 out of earnings for improvements and propelty purchases. The condition of the property is now considered as warranting the reimbursement of the stockholders for these expenditures. If the recommended increase in capitalization is made, it is the intention to declare, a stock dividend, payable Mar. 25, 1913, equal to 15% of the distributed stocks.

UTAH

Beaver County

SHEEP ROCK—The electrically driven mill at this property, near Beaver, is about to be put in commission; Mr. Blainey being in charge of the work.

LINCOLN—D. H. Ferguson has leased the old dump of this mine.

KING OF THE HILLS—Good progress is reported in driving the tunnel on this property in the Granite district, north of Beaver City. The main tunnel is now in 700 ft. and will have to be driven 200 ft. further to come under the old workings. A vertical depth of 400 ft. below the upper workings will be attained.

Juab County

UTAH CONSOLIDATED—At a recent meeting, the following board was reëlected: Thomas R. Cutler, Reed Smoot, S. S. Jones, John C. Cutler, Heber S. Cutler, J. O. Carter and S. J. Jones. It is the plan to start a campaign of development work on the property, now idle, as soon as the weather is mild.

VICTORIA—The electrification of this company's equipment has been completed, and the new compressor is being installed.

IRON BLOSSOM—Lead-silver ore is being mined from between the 300 and 600 levels of the No. 1 workings, and from the 600 level of the No. 3. In the latter workings, copper ore is being taken out below the 600. November profits are stated to have exceeded $60,000, which is more than enough to meet dividend requirements.

CHIEF CONSOLIDATED—Earnings for the first nine months of 1911 were $197,484, or about $21,943 monthly. The surplus on Dec. 1 was about $235,000, and the recently declared dividend will amount to $87,138. Shipments for the first six month of the year amounted to 7968 tons, which brought net returns of $129,879; those for the year of 1911 were 6702 tons, netting $104,494. It is estimated that the total shipments for 1912 will be much greater. The ore comes principally from the 1400- and 1600-ft. levels.

Salt Lake County

WASATCH-UTAH MINING CO.—A 200-ton mill is nearing completion on the property of this company near the mouth of Little Cottonwood. The mine workings have an aggregate length of two miles, and at one place a deposit 600 ft. square has been blocked out. Ore from this place has been treated in a 5-stamp testing mill, and is said to plate from $2 to $3.50 per ton. Chilean mills will be used in the new plant, which are supplied by the Trent Engineering Co. A. W. Nieman is president and general manager.

ALTA CONSOLIDATED—The ore bins are full and it is reported that the teams are making good progress in breaking through the snow drifts in the roads to the mines.

UNITED STATES MINING CO.—A cave-in at one of the Bingham mines of this company entombed a shift boss and three miners; the body of one miner has been recovered but no hope of finding any of the men alive is entertained.

Summit County

MINES OPERATING CO.—The new mill of this company, designed especially for treating the complex Ontario ores, has been completed and turned over by George W. Wood to the superintendent, T. P. Holt. The cold weather recently prevailing throughout the state may delay commencement of operations. The ore to be treated contains about 14 oz. silver, a little copper, and some gold.

Utah County-Santaquin District

UNION CHIEF—Encouraging developments continue in the work now being done in the new drift on the lower level. This drift left the main east level about 1200 ft. from the portal of the tunnel.

WASHINGTON

Grant County

GALENA HILL—A carload of ore assaying about $70 per ton in lead and silver has been shipped to the smeltery. Quite a body of ore has recently been opened up at this property near Rock Cut.

King County

APEX—A receiver has been asked for this mine near Berlin. Abner Giffin, of Seattle is president.

Lincoln County

REARDAN—Ore has been found on this property near Reardan assaying about $10 per ton in gold, and development work is to be continued.

CANADA

Ontario

ELIZABETH—This gold mine in the Lake of the Woods district, which has a 10-stamp mill, has been leased by J. Brandt, former manager of the Cordova mine.

GORDON CLAIM—The Cleveland Gold Mining Co. has nearly completed a new modern plant on this property in the Manitou Lake district.

CANADA REFINING & SMELTING CO.—The main building of this company's plant at Orillia, Ont., was destroyed by fire Jan. 7. The loss was heavy, but largely covered by insurance. The company had been doing an extensive business in the treatment of Cobalt ores.

Ontario-Cobalt

Shipments of ore and concentrates, in tons, from Cobalt for December were as follows:

Bailey	20.00	Kerr Lake	.....
Beaver	.....	La Rose	286.76
Buffalo	184.06	Lost and Found	.....
Casey Cobalt	.....	McKinley-Darragh	245.73
Chambers-Ferland	73.20	Nipissing	86.59
City of Cobalt	.....	O'Brien	86.00
Cobalt Lake	126.53	Penn.-Canadian	30.95
Cobalt Townsite	200.25	Provincial	.....
Colonial	23.33	Peterson Lake (Seneca Superior)	241.34
Coniagas	236.61	Right of Way	.....
Crown Reserve	39.97	Silver Queen	31.25
Dominion Reduction Co.	104.76	Timiskaming	43.88
Drummond	66.80	Trethewey	72.16
General Mines	32.40	Wettlaufer	.....
Hargraves	17.35		
Hudson Bay	.....	Total	2380.84

KING EDWARD—Diamond drilling from the 500-ft. level is being undertaken by the York Ontario Mines Ltd., which is working this mine under a five-year lease. Drifting has also been begun on No. 5 vein and work is being done in a stope above the 140-ft. level. Good milling ore has been encountered and some second-grade ore taken out.

SILVER QUEEN—A vein of pay ore has been struck in the old stopes 20 ft. below the vein in the crosscut from No. 1 level. The mine is being worked under lease by the Aladdin Cobalt, an English company.

Ontario-Porcupine

PEARL LAKE—The shaft has reached the 600-ft. level, where a station has been cut and crosscutting begun to reach the vein encountered on the 400-ft. level, which, it is expected, will be accomplished in about two weeks.

DOME EXTENSION—This mine has been closed down on account of the miner's strike. Rich pockets of ore had been encountered on the upper levels before the mine was closed.

Quebec

CHAMPS D'OR RIGAUD VAUDREUIL, LIMITEE, has recently given an option on its entire property, to A. C. Ludlum, president of the New York Engineering Co., for $1,500,000. The property is in Beauce County, and comprises about 72,000 acres. It has been partially prospected, and was operated successfully during the last season. The property was equipped with hydraulicking equipment which was described in the JOURNAL of Nov. 25, 1911. Engineers are now endeavoring to prove sufficient dredging area to warrant further equipment. It is the intention to equip the property with several large dredges if the present exploration proves satisfactory.

MEXICO

Chihuahua

CONCHENO—The installing of the steam power plant, at the mill of this company at Temosachic, is progressing satisfactorily, although the mine is not being operated at full capacity. The chief work now in progress is the treatment of the slimes that have accumulated for several years. Development work in the mine is being continued.

MINES COMPANY OF AMERICA—The profits of this company, which controls the Dolores, La Dura, El Rayo and Creston-Colorado mines, up to Nov. 30, 1912, were $540,000. Preliminary estimates of the profits for the calendar year are $600,000. All of the mines are now operating, and some operated throughout the year undisturbed by the revolution; the principal difficulties were experienced at the Dolores owing to the burning of bridges, which interfered with the receipt of supplies.

RIO TINTO—With the prospect of early relief in the fuel situation, the probability of closing down the smeltery of this company, at Terrazas, is removed. At this property, as well as the larger mines in the Santa Eulalia district, guards of federal soldiers are kept so as to preclude the visitations of the roving rebel bands.

Durango

GUADALUPE—This mine is preparing for operations next month.

INDE GOLD MINING CO.—This company is operating its cyanide plant.

IRON MOUNTAIN—Negotiations for the sale of this iron-ore deposit, near the city of Durango, to the Monterey Iron & Steel Co. are underway. Small shipments of the ore have been made to Monterey during the last year, and for some years shipments of the ore for flux have been made to the smeltery at Aguascalientes. The property is controlled by an American estate at Des Moines, Iowa. The Monterey plant has been securing its ore supply from its own mines near Monclova in the state of Nuevo Leon, but these deposits at depth are said to be coming into sulphur, a characteristic of most of the deposits of iron known in Mexico.

Guerrero

SIERRA MORADA—Preparations for the examination of this mine, in the Rio Balsas region, are being made by an American company which has recently taken an option on it.

Jalisco

EL FAVOR—This company, controlled by MacKeever Brothers, of New York, declared a first dividend, Jan. 1. The property was operated continuously during the last year despite some inconveniences.

EL ORO MINING & RY. CO.—In December 26,560 tons of ore, and 16,670 tons of tailings were treated, yielding $177,620, the net profit being $62,240.

Mexico

ESPERANZA, LTD.—During November, 8574 tons of ore and 8327 tons of tailings were treated, the total receipts for the month amounting to $130,989. The net profit was £7249.

Sonora

LUCKY TIGER—During November, 2667 tons of ore was treated in the old mill, and 3207 tons in the stamp mill, while in the cyanide plant 5658 tons of current and 1649 tons of old dump tailings were treated. Shipping ore, concentrate and bullion were produced worth $139,657, the total costs amounting to $81,415.

Zacatecas

ZACATECAS TIN MINING CO.—This company, which owns a tin property in the district of Pinos, about eight miles northeast of Ojuelos, has been continuing development during the last year and will soon build a small mill. E. L. Porch, of San Antonio, Tex., is manager.

AFRICA

Transvaal

The cable reports gold production in the Transvaal in December at 776,406 oz., or 19,069 oz. more than in November. The total for the year was 8,237,728 oz. in 1911, and 9,124,299 oz. or $188,599,260, in 1912; an increase of 886,571 oz. over the previous year.

ASIA

Chosen

ORIENTAL CONSOLIDATED—The cleanup for December is estimated to be worth $158,000.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Jan. 15

The metal market has not been notably active. The feature of the week has been the demoralization of the copper market and consequent lower prices.

Exports of Gold through the port of New York, week ended Jan. 11 were: Gold, $2,129,318, chiefly to Paris; silver, $1,147,052, principally to London. Imports were: Gold, $496,069; silver, $425,381, both coming largely from Mexico and South America.

The cable reports the gold production in the Transvaal in December at $16,048,312. This makes the total production for the year at $170,273,734 in 1910, and $188,599,260 in 1912; an increase of $18,325,526, or slightly over the estimate made a week ago.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912	Month	1911	1912
Jan.....	110	111	May....	118	118	Sept.....	111	127
Feb.....	115	109	June....	115	117	Oct.....	112	133
Macrh...	112	111	July.....	112	114	Nov.....	111	129
April.....	114	115	Aug.....	117	120	Dec.....	110	129

Average for year 1912, 119; year 1911, 112; year 1910, 115; year 1909, 115. Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

Gold—Prices of gold on the open market in London continued at the bank level, 77s. 9d. for bars and 76s. 4d. per oz. for American coin. There was a considerable demand from Paris and Berlin and it is evident that Paris is hoarding gold, perhaps in anticipation of political trouble. A somewhat unexpected movement set in this week, $4,000,000 gold being taken in New York for export to Paris. The cause of this movement is not altogether clear.

Iridium—This metal is still in demand and prices continue high, $70@75 per oz. being asked.

Platinum—The market has been rather quiet and demand just now is pretty easy, but there is no change in prices. Dealers here ask $45@46 per oz. for refined platinum; $47.50@48.50 per oz. for hard metal. The foreign market is reported firm.

Silver—The market the past week has depended on the demand from China as quotations from India have been below the London price. The market dropped to 29 1/16d. in London on Jan. 14, and closes quiet at that figure, with tendency depending on the China demand.

Exports of Silver from London to the East Jan. 1 to Dec. 24, reported by Messrs. Pixley & Abell:

	1911	1192	Changes
India.....	£8,702,500	£11,955,500	I. £3,253,000
China.....	990,300	1,831,000	I. 840,700
Total.....	£9,692,800	£13,786,500	I. £4,093,700

Exports of gold from London to India were £116,250 for the week.

Copper, Tin, Lead and Zinc

Copper—Following the publication of the statistics on Jan. 8, which were everywhere taken unfavorably, there was a rush to place copper and prices crumbled rapidly. Among others, certain of the big producers, who had been holding to the pegged price, began to seek business. On Monday it was announced that the price all around had been reduced to 17¼c., delivered, usual terms, but this had no effect in staying the retreat of the market, which already had become a rout, with the London market declining in daily cataclysms. Buyers were naturally bewildered by the events and adopted the policy of abstaining from purchases until conditions became settled. Consequently, the sales of the week, even at the sharp recessions, were relatively small—only a few millions of pounds. On such business as was done all kinds of prices were made on the same day and in the same offices. It is impossible to quote the market closely. For Lake copper our quotations are entirely nominal. The producers of this kind of metal have not been under the same stress of meeting the market as have some of the sellers of electrolytic. The position of the latter has varied widely, certain of them pressing sales, while others have professed indifference, but even those who have announced nominal asking prices appear at the same time to have been courting bids. On Jan. 15 electrolytic was offered in round lots at the equivalent of 16.10c. cash, New York, but other sellers would not do business under 16.50c. At the close the market is very unsettled, with quotations for Lake copper entirely nominal (as no business was done in this quality) at 16½@16¾c.; electrolytic in cakes, wirebars or ingots, 16.10@16.50c. Casting copper is quoted nominally at 16⅝@16¾c. as the average for the week, closing very weak at 16⅛@16⅜ cents.

In the standard market there was very heavy liquidation, and the quotation declined rapidly during the week. The low point was reached on Jan. 14, when spot was quoted £69 17s. 6d., and three months £70 2s. 6d. On this level the market found a little more support, and the close is steady at £70 10s. for spot and £70 17s. 6d. for three months.

The outside producers who were referred to sarcastically a few weeks ago as "second hands," "junk dealers," etc., because they were selling their copper at less than the pegged

DAILY PRICES OF METALS

NEW YORK

Jan.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
9	4.8660	63⅞	17¼ @17½	17.10 @17.30	50⅞	4.30 @4.35	4.15 @4.20	7.00 @7.15	7.00 @7.05
10	4.8700	63⅞	17¼ @17⅜	17.00 @17.10	50⅛	4.30 @4.35	4.15 @4.20	7.00 @7.15	7.00 @7.05
11	4.8695	63⅝	17 @17¼	16.90 @17.00	50⅛	4.30 @4.35	4.15 @4.20	7.00 @7.15	7.00 @7.05
13	4.8690	63½	16¾ @17	16.50 @16.70	50½	4.30 @4.32½	4.15 @4.17½	7.00 @7.10	6.95 @7.05
14	4.8690	63⅜	16½ @16¾	16.25 @16.55	50⅜	4.30 @4.32½	4.15 @4.17½	7.00 @7.10	6.95 @7.05
15	4.8705	63⅜	16½ @16¾	16.10 @16.50	50⅜	4.30 @4.32½	4.15 @4.17½	7.00 @7.10	6.95 @7.05

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. belo w that of electrolytic. The quotations for lead represent wholesale transactionsin the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Silver quotations are in cents per troy ounce of fine silver.

LONDON

Jan.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
9	29 5/16	75⅛	75⅜	80¼	228½	228	17 11/16	26¼
10	29 5/16	74¼	74⅜	79¾	228½	227¾	17 11/16	26¼
11	29 5/16	....	....	....	....	....	....	....
13	29¼	72⅜	73	79	228	226½	17⅛	25¾
14	29 1/16	69⅞	70⅛	77	227½	225½	17⅛	26
15	29 1/16	70⅛	70⅜	77	229	227	16¾	26⅛

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb, except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

price, are now congratulating themselves. Certain of them were able to dispose of their whole output for some months ahead at prices that then looked low, but now look big. Others regret that they were not able to place more than they did.

Copper sheets are 23@24c. per lb., base for large lots; full extras are charged and higher prices for small quantities.

Exports of copper from New York for the week were 8989 long tons. Our special correspondent gives the exports from Baltimore at 2913 tons.

Brass Prices—The American Brass Co. has announced the following prices, effective Jan. 1: Sheets, high brass, 18⅜c. net per lb.; low brass, 20⅛c. Wire, high brass, 18½c.; low brass, 20½c. Rods, high brass, 18⅛c. low brass,; 21¼c. Brass tubing, brazed, 23c.; open seam, 21⅞c. Brass angles and channels, 22¼c. Scrap allowances, 12⅞c. net per lb. for high brass; 14½c. for low brass.

Tin—The tin market in London was very dull during the second half of last week, but considerable speculation developed at the beginning of this week, when comparatively large transactions in future tin took place. This was ascribed to liquidation due to the weak copper market. While these transactions affected spot tin to the extent of about £2, spot tin was hardly sold, as supplies are very limited, and a short sale might become most dangerous. The close, however, is firmer at £229 for spot and £227 for three months.

There was an active business in this market, where future material was readily purchased by consumers. At the beginning of this week it became apparent that spot tin was again closely held and hardly available, with the result that a premium of about ¾c. was established. The close, in sympathy with London, is firmer at about 50⅝c. for January delivery.

Tin shipments from the Straits for the full year were 57,049 tons in 1911, and 61,757 in 1912; increase, 4708 tons.

Receipts of Bolivian tin in England in December were 1917 tons concentrates and 145 tons bars; the total equal to 1295 tons fine tin.

Lead—The demand has fallen off a good deal and a little more pressure is noticeable on the part of sellers. Therefore, business is eagerly competed for at somewhat lower prices. The market closes at 4.15@4.17½c., East St. Louis, and 4.30@4.32½c., New York.

The weaker tendency in the European market has developed still further. The demand is reported as improving, but as stocks in the hands of producers are increasing, is freely competed for at constantly lower prices. The close is easy at £17 for Spanish and £17 7s. 6d. for English lead.

Spelter—Sellers are very anxious to market future metal and are offering at comparatively low prices. No interest, however, is being shown by consumers, who adhere to a hand-to-mouth policy. Europeans, who have a surplus of metal on their hands, are trying to relieve their position by exporting some of the surplus stock to the United States, offering this metal at below their official quotation. The arrivals from abroad naturally will ease out spot position here. The market closes at 6.95@7.05c. St. Louis and 7@7.10c. New York.

The European quotations are £26 for good ordinaries and £26 12s. 6d. for specials.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Other Metals

Aluminum—The market has been moderately active and prices remain about the same. Quotations are 26@26½c. per lb. for No. 1 ingots, New York. The foreign market is steady.

Antimony—The market has been quiet, with only a retail business doing. Prices are easier, Cookson's being quoted at 9¾@10c. per lb.; Hallet's nominal at 9¼c. For Chinese, Hungarian and other outside brands 8¾@9c. per lb. is asked.

Quicksilver—Business has been rather quiet and prices are unchanged. New York quotation is $40 per flask of 75 lb., with 59c. per lb. asked for retail lots. San Francisco, $40 for domestic orders and $37.50 for export. London price is £7 15s. per flask, with £7 10s. quoted by jobbers.

Exports from Baltimore in the week ended Jan. 11 included 660 lb. selenium and 50 lb. tellurium to Germany.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the new cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95W. In computing the total American supply duplications are excluded.

Company	Sept.	Oct.	Nov.	Dec.
Alaska shipments	1,726,715	1,435,235	.....	.....
Anaconda	24,500,000	25,250,000	24,250,000	23,400,000
Arizona, Ltd	3,340,000	3,200,000	3,000,000	3,100,000
Copper Queen	9,103,861	8,184,575	8,807,940	8,805,568
Calumet & Ariz	4,462,000	4,404,000	4,918,000	5,840,000
Chino	3,217,369	3,638,500	3,911,169	3,368,850
Detroit	1,881,668	1,934,828	1,968,620	2,389,875
East Butte	1,416,830	1,398,177	1,245,504	1,314,021
Mammoth	1,834,937	1,883,283	1,805,869	.....
Giroux	1,005,208	.....	.....	.....
Mason Valley	1,200,000	1,563,700	.....	.....
Nevada Con	5,607,578	850,741	.....	.....
Ohio	635,000	.....	.....	.....
Old Dominion	2,204,000	2,523,000	2,758,000	2,262,000
Ray	2,978,404	.....	3,201,500	.....
Shannon	1,142,000	1,210,000	1,436,000	1,360,000
South Utah	225,568	.....	.....	.....
United Verde*	2,750,000	2,750,000	.....	.....
Utah Copper Co	6,616,887	2,022,352	.....	.....
Lake Superior*	19,250,000	21,500,000	20,400,000	.....
Non-rep. mines*	8,094,792	8,250,000	8,250,000	.....
Total production	103,025,987	.....	.....	.....
Imports, bars, etc	25,149,329	28,205,270	.....	.....
Total blister	128,175,316	.....	.....	.....
Imp. in ore and matte	7,142,232	11,224,879	.....	.....
Total American	135,317,548	.....	.....	.....
Miami†	2,949,150	2,577,750	2,972,000	2,913,840
Brit. Col. Cos.:				
British Col. Copper	.....	1,022,904	881,582	.....
Granby	2,083,118	2,018,424	1,852,896	.....
Mexican Cos.:				
Boleo†	.....	2,612,400	2,315,040	2,480,240
Cananea	3,500,000	4,428,000	5,064,000	4,592,000
Moctezuma	771,844	3,045,667	2,112,377	2,793,781
Other Foreign:				
Cape Cop., S. Africa	678,720	757,120	907,200	.....
Kyshtim, Russia	1,750,000	.....	.....	.....
Spassky, Russia	981,120	974,000	974,400	.....
Tilt Cove, Newf'd	.....	86,785	.....	.....
Exports from				
Chile	6,048,000	8,512,000	4,816,000	7,392,000
Australia	7,616,000	9,520,000	10,752,000	9,856,000
Arrivals in Europe$	8,518,720	13,771,520	12,976,320	16,363,200

† Boleo copper does not come to American refiners. Miami copper goeots Cananea for treatment, and reappears in imports of blister.
$ Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
Year, 1911	1,431,938,338	709,611,605	754,902,233	.....	.....	.....
I, 1912	119,337,753	62,343,901	80,167,904	89,454,695	158,323,200	247,777,895
II	116,035,809	56,228,368	63,148,096	66,280,643	154,851,200	221,131,843
III	125,694,601	67,487,466	58,779,566	62,939,988	141,142,400	204,082,387
IV	125,464,644	69,513,846	53,252,326	62,367,557	136,819,200	199,186,757
V	126,737,836	72,702,277	69,485,945	65,066,029	134,176,000	199,242,029
VI	122,315,240	66,146,229	61,449,650	49,615,643	117,801,600	167,417,244
VII	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X	145,405,453	84,104,734	47,621,342	46,701,374	107,408,000	170,473,587
XI	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I, 1913	.....	.....	.....	105,312,582	96,857,600	202,170,182

Zinc and Lead Ore Markets

JOPLIN, MO.—Jan. 11

The High Price for zinc sulphide ore is $59, the base price per ton of 60% zinc $53@56. Zinc silicate sold at $27@32 per ton of 40% zinc. The average price of all grades of zinc is $53.72. Lead ore was advanced $1 for a number of bins to a base of $54 per ton of 80% metal content. The average price of all grades is $53.16 per ton.

SHIPMENTS, WEEK ENDED JAN. 11

	Blende	Calamine	Lead ore	Value
Total week	11,044,340	427,640	1,721,130	$353,991
Two weeks	22,857,570	890,470	3,692,690	727,246

Zinc sulphide value, the week, $301,637; two weeks, $616,227.
Zinc silicate value, the week, $6597; two weeks, $13,763.
Lead value, the week, $45,757; two weeks, $97,256.

PLATTEVILLE, WIS.—Jan. 11

The highest premium price paid this week for zinc ore was $57.50; the base price, 60% zinc, was $55@56. No sales or shipment of lead ore reported.

SHIPMENTS WEEK ENDED JAN. 11

Total for week	3,103,020	.....	1,046,700
Yr. to date	6,538,240	114,100	2,068,700

Shipped during week to separating plants, 1,604,850 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Jan. 15

The Condition of the Iron and Steel Trades remains measurably unchanged. There has been no increase in the volume of new orders with the opening of the year, and it may be said that new business is comparatively quiet. Specifications are coming in freely, however, and there is no let-up in the activity of the mills, or in the demand for early deliveries on contracts.

The United States Steel Corporation on Jan. 14 gave out the following official statement: "In accordance with the recent announcement made by the chairman respecting an adjustment in wages, many of the subsidiary companies of the United States Steel Corporation have made up their schedules, which together aggregate an increase in wages of about $1,000,000 per month, commencing about Feb. 1. These benefits largely apply to the workmen receiving the lowest daily wages. Some of the mining companies are not included, for the reason that wages have been heretofore adjusted by those companies and are now above the average."

PITTSBURGH—Jan. 14

The American Sheet & Tin Plate Co., on Jan. 14, advanced its prices on all sheet products $2 per ton, making tin-mill black sheets 2.30c., blue annealed, 10 gage, 1.75c.; black, 28 gage, 2.35c.; galvanized, 28 gage, 3.50c.; painted corrugated, 2.55c.; galvanized corrugated, 3.55c. Tinplate is not advanced. At intervals in the past two months various independents have advanced their prices and in cases where they were able to make deliveries in from one week to two months have sold considerable tonnages at the advances. The leading interest was booked fully for first quarter and almost solidly for second quarter, so that its advances apply chiefly to third quarter.

As a result of summaries of their position compiled since the first of the year the steel mills find themselves even more fully sold up than they had thought. The large interests have specifications to run them into April, and contract business which, if specified against only fairly well, will run them to July 1. Beyond that date there is considerable special business booked, including car material, structural material, etc., as well as a moderate volume of ordinary requirement business, chiefly with manufacturing consumers.

The unfilled **tonnage of** the United States Steel Corporation at the opening of the new year is reported at 7,932,164 tons, the largest tonnage reported since 1907, but really the largest quantity of actual business in its history, for in 1907 and earlier years tonnage was entered in the reckoning against obligations which are not now considered sufficiently specific to be included. The present 7,932,164 tons shows an increase of 79,281 tons for December, of 1,380,657 tons for the three months ending Dec. 31; of 2,847,403 tons for the year 1912 and of 5,257,407 tons for the two years 1911-12, indicating a tripling in tonnage in two years.

The market has been very quiet as to new buying of finished steel products, which is natural considering the season, and considering that mills are sold far ahead and buyers are covered, more or less fully, an equal distance ahead. The point in the situation is that many buyers claim they are not getting sufficiently good deliveries, although it is a fact that shipments of finished-steel products are at record rate.

Pig Iron—Superficially the pig-iron market is very quiet, but there is a strong undercurrent, and indications that one or more of the large steel interests may buy some large tonnages shortly, particularly bessemer. The difficulty is that they are interested chiefly in early delivery, whereas bessemer is very scarce and could hardly be picked up in any tonnage at the old price of $17.25, Valley, for any early delivery. Several idle merchant furnaces which seemed to contemplate blowing in at the beginning of this month have abandoned the intention, and will not blow in unless they can get coke at a lower figure, or sell pig iron at a higher figure, than is now possible. The coke market has been stiff, but not active. Prompt furnace coke continues at $4. This is no higher than 30 days ago, whereas the holidays were expected to see a material advance. Contract furnace coke is quoted at $3.50, but this is nominal, furnaces not offering over $3. We quote for pig iron: Bessemer, $17.25@17.50; basic, $16.50; No. 2 foundry, $17.50@18; forge, $17@17.50; malleable, $17.25@17.50, f.o.b. Valley furnaces, 90c. higher, delivered Pittsburgh.

IRON ORE TRADE

Buying of Lake Superior ore for Eastern furnaces has been lighter than was expected and few new contracts are reported. Foreign ores are being offered in the East only on a limited scale, though freight rates have declined a little from the high point reached in November.

COAL TRADE REVIEW

NEW YORK—Jan. 15

The Coal Trade in the West has been moving much more freely. Transportation is better and car supply has improved. In consequence supplies at consuming centers are larger and prices are weaker. Demand for steam coal continues very good.

The Seaboard bituminous trade is still affected by transportation conditions and supplies at tidewater are not as plentiful as they might be, especially of West Virginia coal. As a consequence, prices are firm. The steam coal business is active.

The anthracite trade is still in the same condition, with producers trying to catch up with last year's deficit. They have not succeeded as yet, although in domestic trade they have been very much helped by the mild winter.

CHEMICALS

NEW YORK—Jan. 15

The general chemical market is rather active and contracting for the year is going on with the promise of a good business.

Arsenic—The market is gradually weakening and current quotations of $4.50@4.75 per 100 lb. for both spot and future. It is evident that the bulls pushed prices up too far and that accumulated stocks must be worked off at lower prices.

Copper Sulphate—The market is steady with fair business. Prices are unchanged at $5.50 per 100 lb. for carload lots and $5.75 for smaller parcels.

Nitrate of Soda—Business has been very quiet and the fertilizer trade seems rather dull for the season. Current quotations are 2.57½c. per lb. for spot and futures up to April; 2.52½@2.55c. for later positions.

Imports and Exports—Imports and exports of chemicals and fertilizers, including raw materials for chemical manufacture, in the United States for the 10 months ended Oct. 31, were as follows:

	Imports		Exports	
	1911	1912	1911	1912
Arsenic, lb.	4,195,534	4,951,256	5,808	3,386
Copper Sulphate, lb.	.....	.....	6,583,924	5,823,832
Bleach, lb.	68,972,735	61,971,508	17,804	400
Potash salts, lb.	535,336,255	515,317,079	2,672,992	4,085,367
Soda salts, lb.	19,808,725	10,015,181	507,092	388,186
Acetate of lime, lb.	.....	.....	65,493,929	63,675,797
Nitrate of soda, tons.	460,303	404,112	5,363	7,300
Sul. ammonia, lb.	150,921,885	85,557,668	.....	357,600
Phosphates, tons	.....	.....	1,072,489	1,043,323
Sulphur, tons	20,128	24,951	28,031	49,631
Pyrites, tons	863,591	792,364	.....	.....
Magnesite, lb.	220,637,273	193,066,934	2,026,355	2,323,193

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total quantity of sulphur imported in 1912 was 337,074 tons.

PETROLEUM

The monthly report of the "Oil City Derrick" shows oil wells completed in December as follows: Pennsylvania, New York and West Virginia, 449; Lima-Indiana, 74; Kentucky, 9; Illinois, 129; Kansas-Oklahoma, 669; Texas-Louisiana, 99. In all the divisions 1429 wells were completed, with a new production of 47,825 bbl. As compared with the November report, there were 224 fewer wells completed and the new production was 11,011 bbl. less. Of the new wells 231 were dry and 110 were gas wells, a decrease of 53 in the failures and of 55 gas producers. The number of oil producing wells was 1143, as against 1216 in November. The new work under way at the close of December amounted to 573 rigs and 1719 drilling wells, a total of 2292. Every division except Lima shows a small increase in operations.

Assessments

Company	Delinq	Sale	Amt.
Annes, Nev.	Feb. 4	Feb. 25	$0.03
Big Elk, Ida.	Dec. 31	Jan. 30	0.002
Butte & Anaconda, Mont.	Jan. 1	Feb. 1	0.0½
Consolidated Imperial, Nev.	Jan. 8	Jan. 29	0.01
Copper Hill, Ida.	Jan. 5	Feb. 5	0.002
Dry Cañon Con., Utah	Jan. 14	Feb. 12	0.001
High Grade, Mont.	Jan 18	Feb. 18	0.0½
Imperial, Calif.	Jan. 7	Jan. 28	0.003⅜
North Bunker Hill, Ida.	Jan. 1	Feb. 1	0.002
North Star, Nev.	Jan. 13		0.02
O.K. Silver M. & M. Co., Utah	Jan. 30	Feb. 20	0.0½
Ophir, Nev.	Jan. 23	Feb. 14	0.15
Royal, Ida	Dec. 16	Jan. 26	0.00½
Seg. Belcher & Midas, Nev.	Jan. 7	Jan. 31	0.02
Sheridan M. & M., Ida.	Dec. 21	Jan. 25	0.001
Sierra Nevada, Nev.	Jan. 30	Feb. 20	0.10
Superior & Boston, Mont.	Jan. 4		1.00
Tarbox, Ida.	Nov. 19	Jan 28	0.002
Union Consolidated, Nev.	Jan. 8	Jan. 30	0.15
Utah United, Utah	Jan. 9	Jan. 30	0.15
Verde, Utah	Jan. 1	Feb. 1	0.001
Vienna, Ida.	Jan. 2	Feb. 1	0.00½
Wabash, Utah	Jan. 24	Feb. 15	0.05
Wilbur, Ida.	Dec. 23	Jan. 23	0.00½

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	63.471	25.596	24.594	29.299
November	55.635	55.719	62.792	25.680	25.649	29.012
December	54.428	54.905	63.365	25.160	25.349	29.320
Year	53.486	53.304	60.835	24.670	24.592	28.042

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	17.314	12.370	17.661	55.170	76.389
November	12.616	17.326	12.769	17.617	57.253	76.890
December	13.552	17.376	13.768	17.600	62.068	75.516
Year	12.376	16.341	12.634	16.560	55.973	72.942

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1911	1912	1911	1912
January	41.255	42.529	186.896	191.519
February	41.614	42.962	189.642	195.036
March	40.157	42.577	182.617	192.619
April	42.185	43.923	193.042	200.543
May	43.115	46.053	197.767	208.830
June	44.605	45.815	207.388	205.863
July	42.406	44.519	193.100	202.446
August	43.319	45.857	190.479	208.351
September	39.755	49.135	180.846	223.762
October	41.185	50.077	187.138	228.353
November	43.125	49.891	194.967	227.619
December	44.655	49.815	203.358	226.875
Av. Year	42.281	46.096	192.353	209.322

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.655
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265	5.071	4.139	4.894	15.332	20.630
November	4.298	4.615	4.181	4.463	15.821	18.193
December	4.450	4.303	4.332	4.152	15.648	18.069
Year	4.420	4.471	4.286	4.360	13.970	17.929

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380	7.371	6.223	7.221	26.795	26.804
December	6.301	7.162	6.151	7.081	26.849	26.494
Year	5.758	6.943	5.608	6.799	25.281	26.421

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

Month	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	17.90	13.44	17.18	14.34	17.22
November	14.92	18.07	13.30	17.09	14.25	18.00
December	15.15	18.15	13.10	17.45	13.90	18.73
Year	$15.72	$16.01	$13.94	$14.93	$14.49	$15.28

STOCK QUOTATIONS

COLO. SPRINGS Jan. 14

Name of Comp.	Bid.
Acacia	.03⅜
Cripple Cr'k Con.	.01⅜
C. K. & N.	.16½
Doctor Jack Pot	.05½
Elkton Con.	.62
El Paso	6.27
Findlay	.04⅞
Gold Dollar	.16
Gold Sovereign	‡.02½
Isabella	.14½
Jack Pot	.05½
Jennie Sample	.05
Lexington	.004
Moon Anchor	.01
Old Gold	.03
Mary McKinney	.61½
Pharmacist	.01½
Portland	.96
Vindicator	86⅜
Work	‡.002

SALT LAKE Jan. 14

Name of Comp.	Bid.
Beck Tunnel	.08
Black Jack	.10
Cedar Talisman	.01½
Colorado Mining	.18½
Columbus Con.	.10
Crown Point	.03⅜
Daly-Judge	6.25
Grand Central	.75
Iron Blossom	1.35
Little Bell	.10
Lower Mammoth	.04½
Mason Valley	7.50
May Day	.22½
Nevada Hills	1.52½
New York	.00⅜
Prince Con	.89
Silver King Coal'n	.75
Sioux Con.	.04½
Uncle Sam	.11
Yankee	.13½

TORONTO Jan. 11

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.09⅜	Foley O'Brien	.15
Coniagas	7.50	Hollinger	15.90
T. & Hudson Bay	63.00	Imperial	.02½
Timiskaming	.35	Pearl Lake	.29
Wettlaufer-Lor.	.17	Porcu. Gold.	.19
Apex	.01	Preston E. D.	.03
Crown Chartered	.01	Rea	.23
Dobie	.20	Standard	‡.00½
Dome	20.00	Swastika	.09¾
Dome Exten.	.07	West Dome	.14

SAN FRANCISCO Jan. 14

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.03	Belmont	8.05
Belcher	.22	Jim Butler	.70
Best & Belcher	.03	MacNamara	.24
Caledonia	.80	Midway	.34
Challenge Con.	.07	Mont.-Tonopah	1.87½
Chollar	.01	North Star	.20
Confidence	.18	West End Con.	1.42½
Con. Virginia	.18	Atlanta	.18
Crown Point	.20	Booth	.03
Gould & Curry	.01	C.O.D. Con.	.07
Hale & Norcross	.08	Comb. Frac.	.07
Mexican	.99	Jumbo Extension	.33
Occidental	.70	Pitts.-Silver Peak	.65
Ophir	.10	Silver Pick	.05
Overman	.30	St. Ives	.30
Potosi	.01	Tramp Con.	.01
Savage	.03	Argonaut	1.75
Sierra Nevada	.16	Bunker Hill	‡4.50
Union Con.	.18	Central Eureka	.30
Yellow Jacket	.24	So. Eureka	3.00

N. Y. EXCH. Jan. 14

Name of Comp.	Clg.
Amalgamated	70⅞
Am. Agri. Chem.	54
Am.Sm.&Ref.,com	69
Am. Sm. & Ref., pf.	105½
Am. Sm. Sec., pf. B	84
Anaconda	36⅜
Batopilas Min.	1⅜
BethlehemSteelpf	66
Chino	41½
Federal M. &S., pf.	41
Goldfield Con.	2⅛
GreatNor.,ore,ctf.	39
Guggen. Exp.	47¾
Homestake	112
Inspiration Con.	16¼
Miami Copper	23
Nat'nalLead,com.	50¾
National Lead, pf.	106
Nev. Consol.	18
Phelps Dodge	210
Pittsburg Coal, pf.	88
Ray Con.	19
RepublicI&S,com.	23¾
Republic I & S, pf.	82⅛
SlossSheffl'd,com.	40
Sloss Sheffield, pf.	93¼
Tennessee Copper	35⅛
Utah Copper	54
U. S. Steel, com	62
U. S. Steel, pf.	109¼
Va. Car. Chem.	110

N. Y. CURB Jan. 14

Name of Comp.	Clg.
Barnes King	.86
Beaver Con	.44
Braden Copper	8⅛
B. C. Copper	4⅜
Buffalo Mines	2
Caledonia	‡.40
Con. Ariz. Sm.	½
Davis-Daly	2⅛
Diam'field-Daisy	4
Ely Con.	.11
Florence	.40
Giroux	3.7/16
Gold Hill Con.	1/4
Greene Cananea	8⅜
Greenwater	.06
Internat. S. & R.	‡124
Kerr Lake	2 13/16
Keystone	‡2
La Rose	2¾
McKinley-Dar-Sa.	2
Min. Co. of A. new	3⅜
Motherlode Gold.	‡.60
Nev. Utah M. & S.	‡.02
Nipissing Mines	8¾
Ohio Copper	1⅛
Pacific Sm. & M.	3/16
Puebla S. & R.	2 3/16
South Live Oak	‡2
South Utah M. & S.	3/16
Standard Oil (Old)	1110
Stand'd Oil of N.J.	427
Stewart	1⅞
Tonopah	6 3/16
Tonopah Ex.	2⅛
Tonopah Merger.	.88
Tri-Bullion	1/2
Tularosa	11/16
Union Mines	1/4
United Cop., pfd.	10
Yukon Gold	3

LONDON Jan. 15

Name of Com.	Clg.
Camp Bird	£1 3s 0d
El Oro	0 17 0
Esperanza	1 18 3
Messina	1 1 0
Mexico Mines	7 7 0
Oroville	0 6 6
Santa Gert'dis	1 5 8
Tomboy	1 8 9

BOSTON EXCH. Jan. 14

Name of Comp.	Clg.
Adventure	5
Ahmeek	320
Algomah	2
Allouez	36
Am. Zinc	27
Ariz. Com., ctfs.	3¼
Bonanza	.31
Boston & Corbin	5½
Butte & Balak	3¼
Calumet & Ariz	65⅞
Calumet & Hecla	490
Centennial	16¾
Cliff	3
Copper Range	46½
Daly West	3⅜
East Butte	12¾
Franklin	8¼
Granby	64
Hancock	19
Hedley Gold	27½
Helvetia	¾
Indiana	13½
Island Cr'k, com.	55
Island Cr'k, pfd.	85
Isle Royale	37¾
Keweenaw	1⅜
Lake	20
La Salle	4¾
Mass	4¾
Michigan	1⅛
Mohawk	54
New Arcadian	2
New Idria Quick.	6½
North Butte	29¾
North Lake	2½
Ojibway	2½
Old Dominion	49½
Osceola	94
Quincy	72
Shannon	11½
Shattuck-Ariz.	27
Superior	31
Superior & Bost.	2¼
Tamarack	32
Trinity	4½
Tuolumne	2⅞
U. S. Smelting	40¾
U. S. Smelt'g, pf.	49¼
Utah Apex	2
Utah Con.	10
Victoria	1¾
Winona	3½
Wolverine	65
Wyandot	1¼

BOSTON CURB Jan. 14

Name of Comp.	Last
Alaska Gold M.	13
Bingham Mines	4½
Boston Ely	.92
Boswyocolo	‡.01
Butte Central	7 7/16
Cactus	.06
Calaveras	3½
Chief Cons	1⅜
Corbin	.06
Cortez	.55
Crown Reserve	3 7/16
First Nat. Cop.	2½
Majestic	.40
Mexican Metals	1 1/16
Moneta Porc.	.03
Nevada-Douglas	2⅜
New Baltic	.90
Oneco	1⅜
Raven Copper	.23
Rhode Island Coal	.05
San Antonio	‡3½
Smokey Dev.	2¼
S. W. Miami	4
South Lake	5½
Trethewey	.32
United Verde Ext.	.60

‡Last quotation.